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HOMESCHOOLING



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Seventh Grade Edition



Seventh Grade Science

Welcome to the next chapter of your exciting science journey! When you complete this course you will be one of the smartest kids around. Okay, you probably already are, since homeschooled students tend to be super smart! This course is designed to help you push yourself even further by learning to think intelligently and work like a scientist.

The next sixteen units, which we call “**Mastery Badges**” and which are all found in this book, are designed for you to complete while you are in seventh grade. There are 64 mastery badges altogether. Taking four years (5th-8th grade) to complete.

You have plenty of time, so don't rush!
Plan to spend about two weeks per mastery badge.

You Can Do Hard Things!

Remember that anything important is usually challenging. However, challenging doesn't mean impossible! You can do hard things! If you find yourself stressed out or confused, know something really important. Know that everyone feels that way sometimes. Feeling overwhelmed just means that your brain is making room for all the new things you are learning.

Trust In Yourself

Learn to believe in yourself and to recognize your own learning patterns. When you do feel overwhelmed remind yourself that you have felt that way before and that you got through those feelings. You didn't give up then, and because you didn't give up, you mastered the things that used to be hard for you, and you will master these new things as well.

Learning To Be A Scientist

I have been teaching science for many years, and I am sometimes asked a question that sounds something like this:

"Mr. Bertoch, what is the point of science? Why do I have to learn this? How will it EVER help me in life?"

Can you hear the sarcasm? Fortunately, this question has a very easy answer. It is true that learning the job of the mitochondria (a microscopic mini-organ found inside of cells) will probably never come up on a job interview, a tax form, a driving test, or a future business meeting. It is true that unless you grow up to work in the field of medicine you will likely be just fine not knowing what this little bio-machine does. However, this misses a very important point.

When we learn about the mitochondria, we don't just memorize its function. We also learn to be curious. We learn how to do research, make observations, collect data, analyze data, look for patterns, make inferences, and how to support our views and opinions using evidence.

THAT IS WHAT MATTERS! That is why science is so important!

Years from now, you may forget some of the topics we study. I hope you don't. I hope you remember everything. But I harbor no unrealistic expectations. The fact is that you almost certainly will forget some of the topics we studied together during your time with me.

What you will not forget though, and what will absolutely change your life forever, are the practices that make you a more intelligent adult.

You will learn to think. To demand evidence. To use logic. To be curious. To make observations. To invent and create. To solve problems. To trust in your own intelligence and in your own abilities to be successful.

These are thing things that will lead to your success in any future job you choose to work in.

Enjoy Your Science Journey! Science Is So Much Fun!

Topics Studied In The Seventh Grade

During your time in seventh-grade science you will study each of the following topics. By the end of your journey through this grade, you will be an expert on each of these things.

Your goal is to hold yourself accountable to a high standard. You are after all a homeschooled student, and everyone knows that homeschooled students are the most successful kind. You have a high bar, but you are up to the challenge!

Topics of Study This Year

- Mass vs Weight
- Volume
- Calculating Density and Natural Sorting
- Buoyancy – A STEM Lab
- Newton's First Law
- Newton's Second Law
- Newton's Third Law
- Gravity
- Fields / Electricity and Magnetism
- What Is Light?
- Layers of The Earth
- Erosion And Weathering
- Plate Tectonics
- Mountain Formation
- Volcanoes
- Earthquakes

Each of these topics are broken down and explored in great depth using hands-on labs, videos, reading and writing assignments, quizzes, and many other fun and engaging activities.



Before we begin your science journey, I need to share some information with your parents or guardians about how this science curriculum works. Go ahead and hand this book over to them, and have them read the next few pages.

It would be a good idea to review the things discussed on the next few pages together so that both of you understand how this science class works.

Introduction For Parents

Welcome to HandsomeScienceTeacher's Complete Science Curriculum! Welcome also to a fun, engaging, and hands-on science learning journey. Before we jump into the curriculum, let's first take a minute and talk about some routine housekeeping items. Important things like... why this curriculum was created, the pedagogy that it is built on, and how to utilize this resource to achieve the best possible results.

Even before we do that though, I should take a moment and introduce myself to you. Until you know who I am, and you know... why you should listen to me... there is really very little reason for you to continue using the rest of this article. When it comes to educating your child, it is important that you know who you're dealing with. Your children matter to you more than anything in this world. Which is exactly how it should be. Consider the next section my job interview with you. Where I answer your questions about why I am hopefully a worthy candidate to be entrusted with the science instruction of your precious children.

Questions like: Who is this incredibly handsome science teacher? What does he know about teaching science? What experience does he have with homeschooling? What is his personal agenda? What are his credentials? And most importantly... why does he think he is so handsome? Okay, so I won't answer the last question, since no one but me actually thinks that I truly am handsome... I'll do my best with the rest though, and then you can determine whether or not you think the curriculum I have created is worthy of use by your family.

About Mr. Bertoch

I began my career in education way back in 1998. Though my experience with science goes back to my childhood. As a young man, I used to stay up late at night, lay in the backyard, and stare up at the stars. During my idyllic childhood growing up on a farm in Hunter, Utah I was a science addict! Kind of geeky, I know, but I adored science, and absolutely couldn't get enough of it.

In 1998, at the age of 21, I founded a company called The KidsKnowIt Network, which would eventually grow to become the most popular (by traffic) educational portal on the Internet, serving tens of millions of students all over the world every single month. In 2012 when I sold it, no other online educational company was receiving more traffic than ours.

We had the largest (by traffic) Astronomy website, Biology website, Geology website, Geography website, Dinosaur website, History website, and spelling website in the entire world. We also had the

second most popular math website. Our math website never got bigger than CoolMath.com. In that area we had to settle for second place, but that's okay, because the people at CoolMath.com were pretty... well... cool! And hey... you can't win every battle!

I loved building and working at The KidsKnowIt Network. It gave me some amazing opportunities. I got to meet and work with some impressive individuals. Including governments all over the world, in order to develop their science standards and curriculums. As well as top executives for companies like Microsoft, Lenovo, Adobe, Home Depot, and others, as we worked to create educational opportunities in the private sector. I also was given the opportunity to speak at education and technology conferences around the world as a featured presenter. During this era of my life, I was a sought-after expert in the areas of education and technology, especially as it pertains to the sciences. Incidentally, we also published educational books and produced educational videos that went out to school systems around the globe.



In 2012 I had a life-changing epiphany though. As much as I loved my job, one day as I sat in my office, I realized something very important. I remembered that ever since I had been a young boy, I had always dreamed about being a science teacher. Not a speaker, not a presenter, not a CEO, not a science consultant to governments around the world... but a science teacher, in a classroom, working with students.

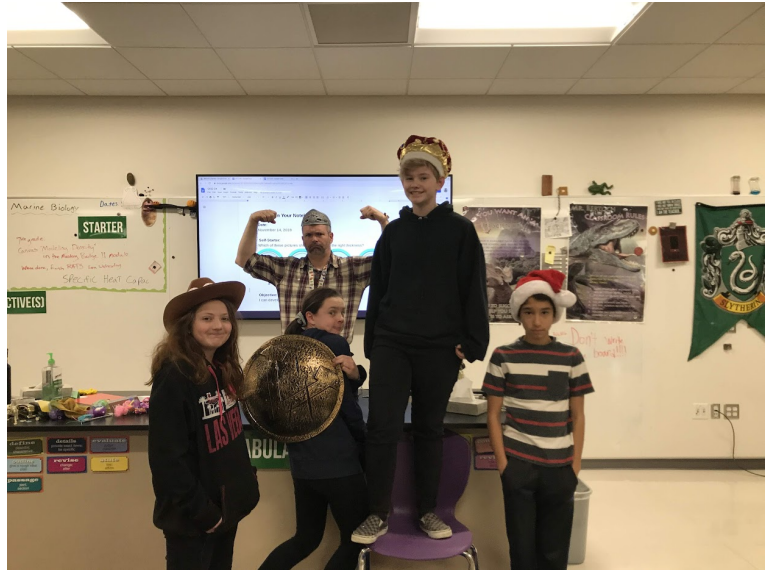
I was happy, but not entirely fulfilled. This realization ate at me, and in time I set out to find investors to take over The KidsKnowIt Network so that I could move myself toward my childhood ambition. To teach! My wife was kind in supporting me in this effort. Which is good, because leaving my influential position behind led to a 95% pay cut. Teachers make WAY less money than CEO's. That's okay though because my decision to enter the classroom also led to a 1000% increase in my overall state of happiness!

Within a year I had earned my teaching certificate, and then found myself hired to teach as a 7th-grade science teacher at West Jordan Middle School in a suburb just outside of Salt Lake City, Utah.

I continued teaching at West Jordan Middle School for the next seven years and absolutely loved it. During my time there I was awarded teacher of the year, as well as science department chair of the year (two different years). During this time, I was privileged to build a science fair program that dominated the State of Utah.

Eventually, my wife and I moved to Charleston, West Virginia where I then began teaching in a 6th-grade science class at West Side Middle School. A position that I continued working in for 3 years. Making my total time in public education 10 years. During my time at West Side Middle School, I was nominated for teacher of the year yet again. An honor that means more to me than I can express.

Following my departure from public education, I spent the next year developing the curriculum in this book and teaching it to homeschool students around the world.



During this time, I taught more than 90 students from all over the world in small classes via Zoom. These students helped me to really refine and improve these learning resources so that they could become as effective as possible for families working outside of a school system. Taking into account the need to modify labs so that they utilize, as much as possible, supplies commonly found at home, adapting lessons so that they are effective without a teacher being in the same room via video instruction, and so forth.

And that pretty much takes me through the present day. But, what about my credentials?

My Credentials

Before you begin using HandsomeScienceTeacher.com's materials, you deserve to have the peace of mind of knowing what my credentials are. What gives me the right to put these materials together? How do you know they will be effective? How do you know that they are built on sound pedagogy? Let's start with my degrees.

Please don't hold the fact that I have multiple degrees against me! I built my business empire without any degrees. During that time, I found that degrees matter far less than experience. Indeed, some of the best employees I ever hired did not have a degree. When it came time to teach though, I had to have them, and so I earned several over my decade as a teacher.

My Degrees

I am lucky enough to have had the opportunity to have earned three degrees. Two in science and one in instructional design. I have a bachelors in Earth Science which covers astronomy, geology, atmospheric science, and oceanography. I have a masters in Biology, and I have a second masters in

instructional design. Instructional design is the methodical study of, and science behind, teaching and learning. With a particular focus on creating effective courses for students.

My Understanding of The Various Science Standards

Don't hold this against me either. I know the standards well, and I know that can be a handicap, if not managed correctly. Please know that I am careful in my application of the standards, and I believe I know them well enough to know when to depart from them.

During my career I have had numerous opportunities to work on the International, National, and state, district, and even school levels in the areas of developing and unpacking science standards. During my time at The KidsKnowIt Network I sat on a number of councils that helped to design and influence the current national science standards in The United States, as well as the science standards used by other countries. During that time my company was also hired by various states and organizations to consult on the creation of their standards. In these efforts, I always focused on using my influence to encourage school systems toward curricula that engendered an independent and logical mindset, where students learned to depend on their own skepticism and ability to think, rather than trusting experts.

During my time as a teacher I worked on the state and district levels to unpack science standards as well as to train other teachers in the district and state on how to teach those standards. When the State of Utah adopted the NGSS standards I sat on the State committee that went through and explored the implementation of the standards, and also spent weeks on the district level training other science teachers on how to utilize the standards.

Once again, my focus was on the important of teaching students to think for themselves, to demand evidence from the so-called experts, and to question everything. I wanted to create scientists, who don't believe me, rather than loyalists who follow what they are taught without question. Science is the process of questioning the experts, not worshipping them. My goal was always and foremost to get students to believe in their own intelligence.

Because of these experiences, I am intimately familiar with The Next Generation Science Standards, which are utilized by most states in the United States, having been part of the discussions and trainings from their creation down through their implementation, and having played at least a minor role in nudging these standards toward a student-centered approach.

My Understanding of Science Pedagogy

What is Pedagogy? It is just a big word that essentially means the science of teaching. In this case, the science of teaching science... which sounds a little strange to say outloud. Science pedagogy is different than reading pedagogy, and different again from math pedagogy. Each content area touches different parts of the human mind, and so different strategies are required to reach learners.

So, what do I know about science pedagogy?

It turns out, quite a lot. Teaching science is something I am very good at. I know this sounds prideful, and I hope you will forgive me for saying as much. I don't mean to sound arrogant, but I am very good at teaching. Especially science.

At both middle schools where I taught, we worked with the most underprivileged kids in our communities. My first school, West Jordan Middle School, was the most highly impacted school in our district and one of the most highly impacted schools in the State of Utah. Our students experienced significant challenges relating to poverty.

My second school, West Side Middle School, was even more challenging. It was located in the highest crime community in the State of West Virginia, where our students lived in conditions that you cannot imagine. These students witnessed atrocities that most adults never see. They were sadly also frequently the victims of these crimes. Many of them lived in homes without utilities and were in constant survival mode.

Despite the many challenges and setbacks that our students faced, I was able to lead them on to scoring on average 20% higher on standardized tests than their peers. When I say this, I don't mean that they scored higher than their peers at the same school. Rather I mean that our poverty-stricken minority students were scoring 20% higher than students in other much more affluent schools and communities. This was an accomplishment that I am very proud of. It proved that our students were every bit as capable as those in more affluent communities.

I mentioned earlier a science fair program that I was lucky enough to get to build. During my time at West Jordan Middle School, I built this science fair dynasty which was unrivaled in the State of Utah.

At its height, we absolutely dominated the district, regional, and state science fairs. Averaging 30-40 kids every year going to the Central Utah State Science Fair, and 5-7 kids every year winning at the state science fair. I was even able to take 3 kids all the way to the national science fair where 2 of them won 3rd place in their division. **All of this from within these highly impacted schools!**



My students learn. They don't just memorize facts. They actually understand the content and are able to use it to do real science on their own. I know how to teach science in a way that builds scientists, rather than just making them memorize facts.

The strategies used in this curriculum are proven to be successful. I do not believe in busy work! Busy work is a waste of time. Everything we do is intentional, has a purpose, and is tied directly back to helping students become intelligent thinkers. Likewise, the order of how I present the content is intentional.

Touching Students Brains As Many Times As Possible!



This curriculum is designed to touch students' brains. Not literally! Thank goodness. That would be gross. But rather, my curriculum is designed to repeatedly touch a child's mind in a way that forces their brains to retain what they learn. Every time we poke the brain neuropathways in their mind for that content become stronger.

Here's the deal though. We don't want to just touch one part of their brain over and over again. To be truly effective, we need to touch as many different parts of their brain as possible. This is because each time we

engage another part of their brain, we once again strengthen the pathways that store the knowledge they are learning.

Thus, we want to use the part of their brain that listens, the part of their brain that talks, the part of their brain that reads, the part of their brain that writes, the part of their brain that is creative, the part of their brain that is analytical, and above all, the part of their brain that is responsible for physical movement.

My curriculum engages their entire mind and body in the learning process. Forcing them to activate all of these parts of their brain. Which most other curriculums ignore. Most curriculums focus solely on memorization and reading. We will be engaging the entire mind, and in so doing, students will end each unit having created a very well-laid-down neuro network.

They will not just be able to recall a memorized fact. They will understand the fact, and how it relates to other facts. They will be able to utilize what they know to solve new problems. Their science education will form an integrated whole that will help them to understand the world for what it really is, and to think analytically about it.

Most importantly, they will learn to question the experts. They will learn to view themselves as every bit as smart as any expert, and as capable as anyone else of looking at data and drawing their own intelligent conclusions. Instead of being dependent on others to spoonfeed them knowledge, they will learn to seek out knowledge on their own and to determine for themselves what is true, and what isn't.

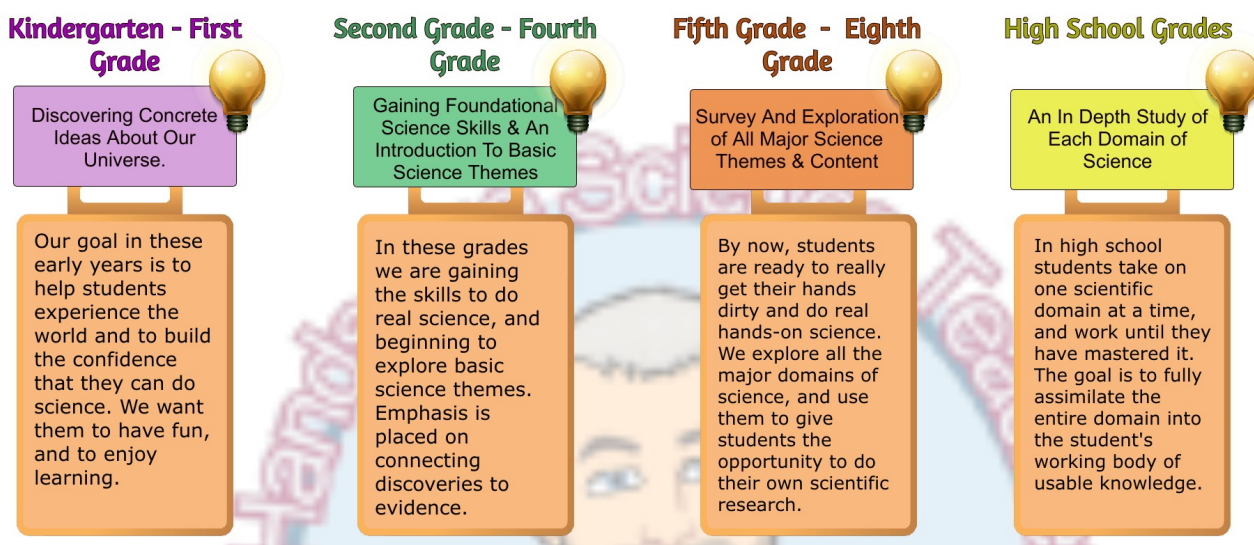
At no point in this curriculum do I tell them what they have to believe. Rather, I empower them to find truth on their own. It is not my job to impart my own agenda to them. Rather, it is my job to teach them to be skeptical of me as the teacher and to do their own research.

How This Curriculum Is Organized

A lot of thought and experience has gone into organizing this curriculum so that it is as effective as possible. To get the most from these activities it is important that your student complete them in the order that they are presented.

First Let's Look At The Curriculum As A Whole

The curriculum, which spans K-12 grade was created in order to achieve two very important purposes. Firstly, to develop intelligent, confident, and independent thinkers. Secondly, to impart a very deep understanding of all domains of science. To achieve this goal, the curriculum follows the framework expressed in this diagram.



As students progress through the curriculum mastery badges will become increasingly challenging. However, they all follow the pattern outlined below.

We Always Start With Discovering Labs



Every unit, or "Mastery Badges" (more on mastery badges later) starts with what I call a Discovering Lab. Research shows that students learn and retain their knowledge best when they "discover" it for themselves, rather than when they have a teacher simply lecture to them. These discovering labs are designed to give students the opportunity to make their own discoveries.

When students begin a new Mastery Badge they won't yet know a lot of the vocabulary associated with it, and that is okay. When completing a Discovering Lab, we are not yet concerned with vocabulary. Instead, we are only working to give students experience and exposure to the concepts. These are hands-on projects that allow the students to get their feet wet with the material.



When scientists make new discoveries, they too lack the vocabulary. Because they haven't yet made up these new words. In other words, a real-world scientist makes up the vocabulary words only after they make the discoveries. Thus, in the same way, it is okay that your learner doesn't yet have the vocabulary words to describe what they are learning from a discovering lab. These words will come later on.

Students should complete the Discovering Labs carefully and do high-quality work. If they do not know what something means, they can and should research it using available resources such as books and online articles. **It will be tempting for students to look ahead to the instructional video or the article that go with the Mastery Badge.** Encourage them not to do this. They will gain more by doing their own research than by looking ahead.

How is doing research any different than looking ahead to the video or article that go with a Mastery Badge? It may seem like a subtle difference but it is important. By looking ahead to see what I teach in the video, they find answers that they will be tempted to accept as empirical. Because I am the teacher they will view what I say as the "correct" answer.

However, by doing their own research and watching outside videos, or reading outside articles, they will come across a wider array of opinions and views on a topic. They will have to read and evaluate these for themselves and decide what they believe. This is an important part of science. Scientists do research all the time. They read scientific journals and analyze articles as they try to learn what other scientists have already discovered.

It is okay for your learner to do research while completing a Discovering Lab (outside videos and articles) but resist the temptation to watch MY videos or read MY articles until after the lab is complete.

Scan the QR Code above to watch a video of me talking about Discovering Labs.

The Second Part of Every Mastery Badge Is Instructional Videos

Every Mastery Badge includes one or more instructional videos, where I teach your student the material. Again, it is very important that students complete the Discovering Lab before watching these videos. It seems like a small thing, but it is actually huge. We want students to make their own discoveries prior to listening to me talk about the science behind what they have observed or researched. We want them to have formed their own opinions before I bias them with my teaching.



These science videos are easily accessed using any device via a QR code located within each Mastery Badge. They are free and included with this book. On average each video is about 10-20 minutes long, though younger grades tend to be shorter, and older grades tend to be longer.

Encourage students to really pay attention and to pause whenever they don't understand something. If they are confused they can rewind and rewatch, and even research online or in books to better understand a confusing topic. Your student's goal should be to not move beyond the video until they fully understand what is being taught.

In the older grades students are asked to write down 10 things that they learn from each video. Which helps them organize their thoughts. In younger grades they draw pictures, or do a combination of both. This engages the parts of their brain that both listen and write, and helps to create greater pathways in the brain.

The Third Part of Every Mastery Badge Is Literacy Assignments



It goes without saying that reading and writing are very important. In fact, I don't think you could overstate just how important these skills are. Reading and writing cut across all content areas and for that matter, pretty much all aspects of life. In science, we read whenever we are doing research, and we write whenever we are communicating our discoveries to other people.

Each Mastery Badge includes a Literacy Assignment. In this assignment, students read an assigned article on HandsomeScienceTeacher.com (accessible by QR code) and where they will then write about what they read. They will also complete an online quiz that goes along with the article in order to check their understanding.

Take the time to really stress the importance of "Reading For Understanding" and "Writing To Communicate." Help students take ownership over their own reading and writing journeys. Younger students will need help reading and writing. Older students should be able to work on these literacy assignments more independently.



What does it mean to read for understanding?

All of us can relate to reading something while not being present in our own minds. All of us have experienced having read something only to get to the end of it, and realized that we didn't retain any of what we read.

Reading For Understanding means that the student holds themselves accountable for their reading. This is an important learned skill. One strategy they can use is to stop every few sentences and intentionally ask themselves whether or not they are still paying attention. Other strategies include looking up vocabulary words they don't understand, and repeating back in their own minds what they are learning after each paragraph.

There are many strategies that can be used when working to read for understanding. Discuss these with your learner, and teach them to hold themselves accountable, so that they don't simply skim articles or race through them.

What does it mean to write to communicate?

Writing To Communicate means that students write clearly, concisely, and in a way that communicates complete thoughts. I tell students that it is helpful to imagine that they are writing to someone younger than themselves. We tend to write much better when we imagine that our audience is someone younger and less experienced than ourselves, than we do when we write to a teacher or an adult. Write in a way that instructs the reader, and helps them fully understand the topic.

This means planning your writing out, and being intentional in how you present your arguments.

Note that many of the writing prompts presented in these literacy assignments call for a student to write two or more paragraphs. However, they do not specify a definition for what a paragraph is. There is nothing in this curriculum that specifies a paragraph must be a certain number of sentences long, or that it must follow a particular standard format.

This is intentional, in order to allow this curriculum to play nice with other curriculums that you may be using in your homeschool journey. When a prompt says to write a paragraph, this should be interpreted according to whatever standard you are currently holding your students accountable against. If your definition of a paragraph is five sentences long, then students should write accordingly. If it eight sentences long, then likewise, you should have your students follow that standard.

Scan the QR code above to watch a video of me talking about how to Read For Understanding and Write To Communicate.

Online Quizzes

Every article includes an online quiz that checks your learning. This is an opportunity for your student to see how much they really understood from the reading assignment. A standard goal would be that students score at least 75% or higher on these quizzes before moving on. However, you are free to adapt this to your own use and alter the requirements to fit your own needs. If students don't meet your expectation for them, have them re-read the article, and retake the quiz.

All Mastery Badges End With A Capstone Applying Labs



The capstone of every Mastery Badge is an Applying Lab. These Applying Labs should be the last thing that your student does before passing off a Mastery Badge. They are culminating activities that require your student to use everything they have learned throughout the Mastery Badge.

In order to truly prove their competency with a Mastery Badge, and that they are indeed ready to pass it off, students should complete these Applying Labs from memory. If your student is able to complete the entire lab from memory, then that is a pretty good indication that they are ready to pass off the badge.

Note an important caveat though. When I say “complete the lab by memory” I am not referring to data or experiment results. I am referring to concepts and procedures. It is okay for students to look up data. Indeed many of the Applying Labs specifically call for them to do this in the directions and procedures.

Part of being a scientist is knowing how to look up data and how to complete experiments and simulations. What we care about isn't that they don't look up any data. Rather it is that they don't have to look up any of the procedures, or core content. **In other words, do they understand the science, and can they use it to solve problems?**



What Are Mastery Badges

As a middle school teacher, one of the things I learned very early on was how meaningless grades are. They truly are completely and absolutely worthless. Or, at least mostly so. **The only thing a grade really shows is how well a student is able to meet the arbitrary expectations of a particular teacher.**

What they do not show though is how the grades of one teachers stack up against those of another. Johnny may earn an "A" in one class, but perhaps the same amount of work would have only earned him a "C" in another class down the hall.

More importantly neither grade tells us anything about how well Johnny actually understands the content. It is very possible to get an "A" in a class, without ever actually understanding anything that the teacher was teaching. All of us have undoubtedly BS'd (Bologna Sandwiched) our way through a class. Often, it is enough to just turn in completed assignments and be likable to the teacher. Our work may not even have correct answers! Because teachers are busy, and if the assignment looks complete they will often give you a good grade on it, without actually checking your work (yes, teachers really do this).

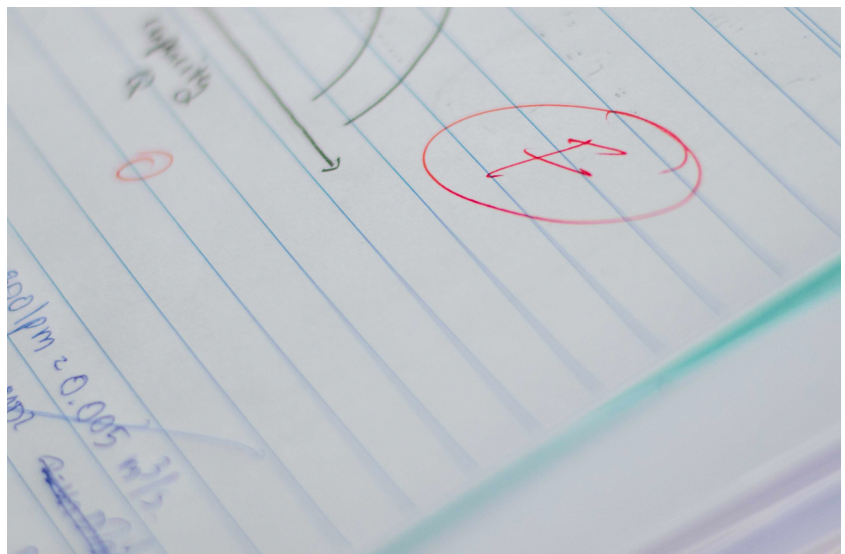
An "A" can mean a lot of things. None of which are consistent from class to class, school to school, or teacher to teacher. But, what about an "F"?

Failure In Education Doesn't Make Any Sense To Me!

The biggest reason of all for my absolute loathing of the letter grading system has to do with the letter F! The big FAIL! What a stupid concept!

Children work really hard to try and learn something, and then when an arbitrary date on a calendar arrives the teacher decides that students are no longer allowed to continue trying.

These teachers pronounce any students who did not accomplish whatever task they were supposed to accomplish by that date to be FAILURES. Not because they can't learn. Not because they are unwilling to keep trying. But simply because the calendar says they are out of time, and its too bad for them!



I can't imagine doing that in any other aspect of childhood. Can you? Imagine if a piano teacher worked that way. A child sits down to play the piano, and the teacher tells them that they have two weeks to learn a song, and if they don't do it by then, they will be a failure. Imagine if a basketball coach worked that way! An eager little budding athlete shows up to practice each night and faithfully works to improve their free throw, only to have the coach tell them after two weeks that they are a failure.

Yet, this is exactly and precisely what we do in education. **It is almost child abuse in my opinion.** It destroys that child's sense of well-being for no valid reason whatsoever. Declaring students to be failures accomplishes no good purpose. It neither motivates nor instructs. It is simply cruel and lazy on the part of the education system. What needs to happen is, like the piano teacher or the basketball coach, constructive feedback be given so that the student can continue to progress.

Learning Doesn't Work The Way Public Education Insists On Teaching

Learning doesn't happen on the same timeline for every student. Some students learn some topics more quickly, while requiring additional time to learn others.

Returning to our example of a music teacher. A student who learns to play a song on the piano in three weeks is every bit as successful as the student who learned to play it in two. A child who needs a few extra seasons to master their free throw is every bit as valuable to a professional recruiter as the athlete who mastered it in a few months.



It is the final result that matters, not the time it took to get there.

Mastery Badges allow me to give each student their just reward when they complete a unit by mastering all the content associated with that unit. I created Mastery Badges during my first year as a public school teacher and I have never looked back.

Think of them as merit badges in scouting. In order to earn a Mastery Badge a student needs to complete all the assignments associated with each Mastery Badge. This includes passing off the quiz and completing the Capstone Applying Lab (from memory).

Student Self-Evaluation

Throughout each Mastery Badge your student will repeatedly be asked to stop and self-evaluate or "check" their own progress. **Research shows that the single most influential factor in a student's learning success has to do with their ability to self-evaluate.** Students who stop and review their own progress do significantly better than students who don't take ownership of their learning.

As their adult guide, make sure that students are taking the time to honestly evaluate and own their progress. At the end of each Mastery Badge, before awarding the badge to them, have students honestly look back over their work and reflect on their efforts.

Your Role As A Mastery Badge Counselor

Ultimately, it is up to you, the adult to determine whether or not a student has passed off a Mastery Badge. It is you who will act as their Mastery Badge Counselor, and who will be responsible for passing them off. Be honest, supportive, and kind in this role. Hold students accountable with constructive feedback. Discuss and decide together whether or not a student has achieved mastery of the content.



What Does Mastery Mean?

Mastery refers to the student's ability to recall and use the knowledge and practices taught in the Mastery Badge. This includes the content as well as the Science And Engineering Practices. If students are able to easily recall the content and vocabulary, and if they are able to use this content to solve real world problems then they have "mastered" it and are ready to move on. If not, that's okay! We are not in a rush. Take the time to go back over the content and fill in the gaps.

Save The Mastery Badge Certificates

The Mastery Badge Certificates in this book are meant to be saved in your homeschool files. They provide evidence to the state, should you ever be audited. Showing that your student has completed a valid and thorough science curriculum and that they mastered the concepts.

The Eight Science & Engineering Practices And The Crosscutting Concepts

Over the past decade most school systems have been moving toward the Next Generation Science Standards (NGSS), which are built using what is often referred to as 3D science. These three dimensions include content, crosscutting concepts, and the eight science and engineering practices.

HandsomeScienceTeacher's Science Curriculum is built on these three dimensions of science. You will see both the crosscutting concepts and the eight science and engineering practices throughout each Mastery Badge.

Sometimes national and state standards get things very wrong. Other times they get them very right. This is a case of the latter. The eight science and engineering practices are tools that help us create intelligent thinkers. They go way beyond the scientific method that you and I were taught when we were young.

The Eight Science & Engineering Practices Include:

- Ask Questions.
- Develop and Use Models.
- Plan and Carry out Investigations.
- Analyze and Interpret Data.
- Use Mathematics and Computational Thinking.
- Construct Explanations.
- Engage in Argument from Evidence.
- Obtain, Evaluate, and Communicate Information.

The purpose behind these practices is to help students become scientists. It isn't enough to simply memorize Newton's Laws of Motion. We want students to be able to use these laws to do actual science and to solve problems. We want to create scientifically minded students.

The more than 400 labs that your student will complete throughout their years working in this curriculum are built on these eight science and engineering practices, as well as on the crosscutting concepts.

The Crosscutting Concepts Include:

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Function
- Stability and Change

Your Child Is Every Bit As Smart As Any Expert

Let's be honest. Your child is smarter than most experts. Sadly, in today's world, there are a lot of so-called experts, who really are not that intelligent. They may have degrees and lots of letters after their names, but they aren't thinkers.

They aren't the people who developed the domains they now rule over. Those great thinkers of the past came, created new knowledge, and then retired, inevitably passing on. The ideas they created were passed on to people who studied their works but never really learned to create new knowledge themselves. These experts are all too often devoted disciples of the great minds of the past, rather than self-informed thinkers in their own right.

This curriculum teaches your child to trust their own intelligence and to demand that the experts prove the claims they are making.



How Much Time To Spend On Each Mastery Badge

Each Mastery Badge is designed to take approximately two weeks to complete. You may finish some more quickly while others may take longer, but as a general rule plan your pacing around two weeks per badge.

Remember that you are not in a race. Mastery is far more important than finishing quickly. If a badge takes three or four weeks don't worry about it. There is space in your schedule for some badges to run a little longer.

Goal: Complete 16 Badges Per School Year

The curriculum has been designed so that you only need to complete 16 badges per school year. If you complete these badges at the suggested pace of one every two weeks then you will only need 32 school weeks to finish all 16 badges. A typical school year includes 40 weeks, which means that you have time for Christmas break, Spring break, and also for some badges to take a little more time to finish.

If you finish in April, is that really so bad? You can move on if you want and work ahead, but it is also okay (and even encouraged) to just deschool a bit and enjoy an early summer break. Go outside, go for walks, and enjoy childhood!

These little ones only get one childhood!

Everything Your Student Needs To Know For Science

This curriculum covers everything your student needs to know for their entire science education. By the time they finish this curriculum if they work hard and keep themselves accountable to their own success, and if their results are like those of my other students, **they will score higher on standardized science tests than the vast majority of their peers.** Including those who have been taught in public and private schools.



Likewise, they will have a very strong footing preparing them for college and beyond. They won't just have memorized a bunch of disconnected random scientific facts in order to pass a class. Instead, they will have become functioning scientists, who think analytically and who are able to use data and evidence to solve real-world problems.

What Is My Agenda?

Unfortunately, in today's world parents have to be concerned about the various agendas hidden beneath the curriculum that is presented to their students. It is sad that this is the case, but it is a reality. Rest assured that great effort has gone into making sure that HandsomeScienceTeacher's Curriculum is completely agenda-free. Or at least in so far as it is possible for me to hide my own biases I have done so.

It is not my job to teach your student my values. It is my job to teach them science, and I stick to that very strictly. To that end, you have access to every lesson, every video, and every article before your child accesses them.

I have opinions, but I do my utmost to keep them out of the instruction.

Why I Created This Curriculum

I am going to be very honest here. Perhaps too honest, considering I just got done discussing how I do not allow agendas to surface in my teaching. I will permit myself this one single exception, and I hope you will forgive me for indulging in it.

I recently left the public education system. I did this because I have grown increasingly alarmed and concerned by some of the things I have seen. In my opinion, it is wrong, incredibly wrong, for school systems to teach students things without parental consent that may run counter to the values held in the student's home. Likewise, it is wrong for teachers to ask students to confide in them, and to

promise these students that the teacher will not disclose what has been confided to their parents. I have watched over the past decade as wonderful teachers have retired and as their younger replacements have come in much more willing to hide things from parents or promote their own agendas.

I have sat in meetings where teachers have openly discussed the most basic psychological needs of students while advocating against bringing parents into the loop and even suggesting that parents don't have a right to be involved.

As a person who tries to live a life of integrity, I could frankly no longer be part of a system that increasingly advocates teaching ideas, values, and concepts that parents object to. Especially when these school systems have publicly denied doing the very thing they aggressively pursue behind closed doors.

In fairness, I have had some wonderful principals and have worked under fantastic leadership. However, as the years have progressed, those stepping up into new leadership positions have become increasingly willing to suppress parent access or mislead families in what is actually being covered in classes.

People of integrity teach in the light of day. They are not afraid to let parents see behind the curtain, and they certainly do not mislead parents. If you feel a conviction within your heart to teach something then its rightness should be so self-evident that it can withstand the scrutiny of parental oversight. If you believe that the parents are wrong, this can never justify lying or misrepresenting what is being taught.

The final straw for me came when I found myself debating fellow teachers over the rights of parents. I found myself exasperated by my inability to convince a growing number of my colleagues that it was wrong to lie. Each year more and more teachers were resolutely convinced of the rightness of their efforts to promote ideas contrary to the will of parents. As these attitudes crept into leadership mandates were beginning to be written that required teachers to participate in this kind of disingenuous behavior.

People of integrity do not behave in such a manner, and again, being someone who strives, though admittedly often falls short, of such an ideal, I felt I could no longer participate in such a system, and still maintain my honor.

Fortunately, due to my earlier success in business, I didn't need the income, and though I loved working with my students, I made the decision to step into the world of homeschooling.

A Massive Wave of Homeschoolers

Beginning in 2019 a massive wave of students left public education to begin homeschooling. This is nothing short of an absolute tidal wave! We are talking about millions of families who made the decision to leave the school system. My family was among them. We took our children out of public schools and into the wonderful and exciting world of homeschooling.



I Wanted To Be Part of The Solution

I have a lot to offer my fellow homeschooling families. My journey in the education system has been long and thorough. My credentials are deep and extensive. I was part of the initial group of “influencers” though the word didn’t exist at that time, who built the first meaningful educational websites and portals. I have worked in the trenches designing national and state standards. I have taught in the classroom. I have all the degrees and credentials. I was teacher of the year and science chair of the year, and I understand homeschooling from the perspective of a parent.

I left public education at the end of 2021 so that I could begin to build this curriculum and **make it available completely free of charge** to you. There are other very excellent curriculums out there already. However, to my knowledge, there are very few if any others that are built on three-dimensional science or that take into account the best pedagogical strategies

Why Is This Curriculum Free?

Firstly, let me explain what I mean by free. Since many who encounter this curriculum will have paid for it. If you purchased this curriculum in book form, then yes, it was certainly not free. There was a cost associated with the binding and production of the physical book. However, many of you will have come across this curriculum in digital form. Which is freely available for download and distribution without remuneration to the author.

If you have a digital copy of this curriculum please share it! Post it freely. So long as you do not alter the file, you are welcome to print it, photocopy it, and use it to your heart's content.

My purpose in creating this curriculum has never been to make money. **It is and will always be about being part of the solution.** It is about giving back and helping to fix a very broken education system.

There are millions of families who have pulled their students out of the public education system. These parents showed great courage in these actions. It is scary to take your student's education into your own hands. The trends we are seeing right now in public education put many families in a very difficult spot. Torn between a desire to protect their kids from the predations of decaying agendas, and the utter terror around the many unknowns of teaching at home.

These families deserve the very best without having to spend a lot of money. It is to these families, that I offer this curriculum at no cost.

A lot of effort has gone into making sure that this curriculum meets the highest standards. Free can sometimes equate to low quality, however at least in the case of these materials, free does not mean that you are getting something that is less effective.

In my very experienced opinion, you are simply not going to find a better curriculum on the market, than what I have produced in these books.

Lab Supplies Available on HandsomeScienceTeacher.com

Having said that, I do sell lab supplies on my website www.HandsomeScienceTeacher.com. These supplies are provided at or below market cost, as a service to those families who may need them. Please do not feel pressured to buy these supplies from me. In fact, I go out of my way in the content to provide alternative supplies you can use if something is not available to you.

However, in those cases where families do desire to purchase (or rent) lab supplies they are available. If you are considering investing in lab supplies, may I recommend **The Lab Essentials Kit**, which contains the most common items used in the labs found throughout this program? These are the items that I find students usually do not have at home, including a small pocket microscope, a graduated cylinder, a precision scale, a compass, a metric ruler / magnifying glass, tweezers, specimen jars, safety glasses, and a few other odds and ends. This kit is sold significantly below retail value.

We also rent out a limited number of higher-end items including professional-grade microscopes, microscope slides, models, and various other things you might find in a school laboratory, but that you might not have access to at home.

To look through our inventory go to www.HandsomeScienceTeacher.com.

What Can You Do To Help?

In exchange for utilizing these free resources, I ask for very little in return. All I really hope is that you will pay it forward. If you find this curriculum useful, please consider doing some of the following to help others find it.

- Consider posting a .pdf of this curriculum (available on HandsomeScienceTeacher.com) to your various homeschool groups online.
- Consider leaving a review of this book on Amazon and in other places. This helps so much more than you know, because it pushes the book up further in their searches, helping others to find it.
- Consider subscribing to my YouTube channel. Again, this helps by lending credibility to the channel, and as a result, helping the science videos climb higher in the results.
- Post our videos anywhere and everywhere. Feel free to incorporate our YouTube videos into your own projects. So long as they are not edited, and are imported via our YouTube channel. This helps us get the word out about these resources.
- Talk about this curriculum with family and friends who also homeschool.

I am deeply grateful for any and all such gestures, that help me let families know about these free resources.

Errors In This Book

Creating these books was a monumental task that has already taken more than two years and thousands of hours to complete, and that will involve at minimum two more years of full-time work. While I am 100% confident in the scientific principles and the pedagogy, I am not 100% confident that there are not some typos or grammatical errors that I missed during editing.

A project like this usually is overseen by a vast team. Just look at the credits page of a typical textbook! I do not have a team to help me. For me, this has been a labor of love. That I have funded out of my own pocket, and that I am giving away freely once it is completed. When it is done it will include more than 15 textbooks with over 500,000 words of copy, hundreds of online articles with an additional 500,000 words of copy, and hundreds of videos and online quizzes.

A project this massively immense would take an education publishing firm 5-10 years to produce and would be overseen by a team of hundreds of people working full-time. The books would go through editors and proofreaders.

I am the writer, the editor, the proofreader, the video editor, the website programmer, and every other role associated with bringing this project to market. Each time I have gone over the text I have found errors. Again, not with the science or pedagogy, but with grammar, copy and paste errors, and so forth. It is absolutely inevitable that I missed some.

My options were to never release it or to put it out there and crowd-source the proofreading. In the end, I choose the latter.

If you find a mistake, please visit HandsomeScienceTeacher.com and report it. There is a link for reporting errors at the bottom of every page. I will correct the errors you report and update the project as we move forward together.





Mass & Weight

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about mass and weight. Including how they are related to each other but that they are not the same things.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is Matter?
- How we measure matter.
- How gravity affects matter.
- What is mass?
- What is weight?
- Mass and weight are not the same things.

Name: _____

Date: _____



Discovering Lab

Learning Through Hands On Activities



Activity: Discovering Weight

Directions: Follow the steps below to discover how different objects have different weights



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about weight and mass

Experiment 1: Collect Data About The Weight of different objects

Scientists support their conclusions with data and evidence. As a scientist, it is important that your data be accurate and precise. Take your time and hold yourself to a high standard. You want to be a good scientist!

Supplies You Will Need:

To complete this lab you will need a scale. It would be best to use a precision scientific scale. If you don't have such a scale, you can purchase one for very little money on HandsomeScienceTeacher.com. Alternatively, you can also use a kitchen scale or a bathroom scale. A kitchen scale will be more precise than a bathroom scale.

1. Select five objects to weigh.
2. Record your results below.

Object	How much does it weigh?

Analyze Your Data

After collecting good and precise data, scientists use their data to draw conclusions about how the Universe works. Look over your data and see if you recognize any patterns. Why do you think some objects are heavier than others? Which objects were heavier and how were they different from the objects that are lighter?

Experiment 2: Discovering Mass

1. With an adult's permission, go outside and collect 100 rocks of about the same size.
2. Put your rocks into a bag and weigh them.
3. How much do your rocks weigh?

4. Now remove 50 of the rocks and weigh the bag again.
5. How much do the rocks weigh with half of them removed?

6. Why do you think the bag weighs more when there are more rocks in it? Give a detailed explanation of what is going on.

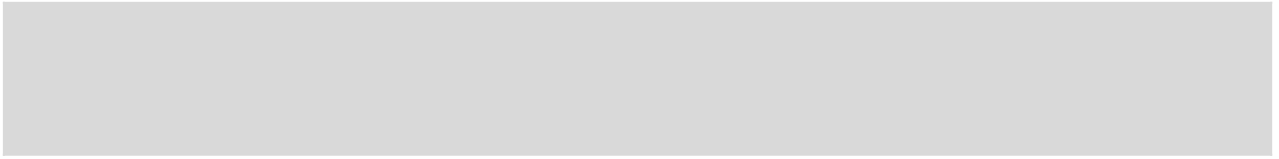
7. In your experiment you have seen that adding more mass (rocks) to an object increases its weight. You have seen that there is a direct connection between how much mass an object has, and how much it weighs. Now, consider another example. If a car weighs more than a basketball, which object is more massive? In other words, which object has more mass or atoms? Explain why this is the case.

Final Questions:

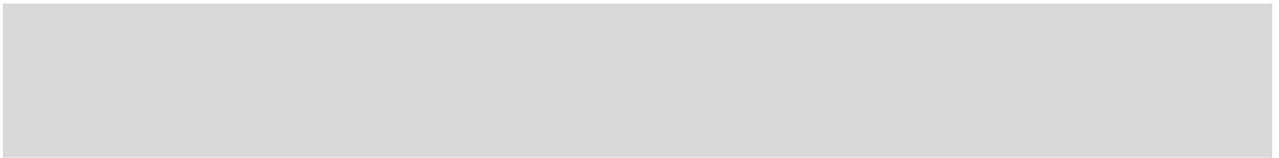
Remember to answer all your questions using complete sentences.

1. What does mass tell us about an object? In other words, what does the word mass mean?

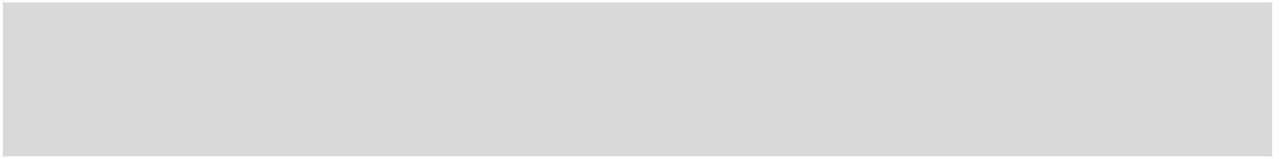
2. Is it possible to count the total number of atoms to figure out how much matter an object has? Why or why not?

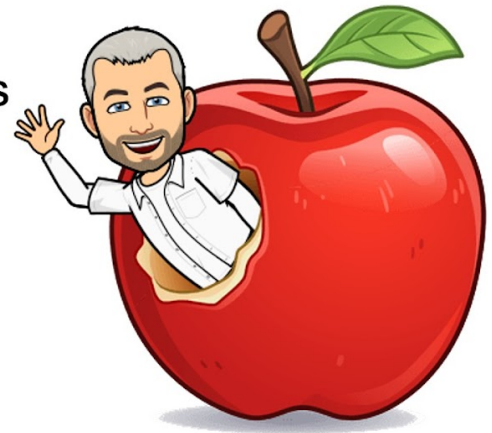


3. If we can't count up all the atoms, how else can we describe or measure the mass? Think about the experiments we just did. How did we figure out which ones were more massive and which ones were less massive?



4. Scientists often use weight to determine which objects are more massive and which objects are less massive. Why do you think they do this?





Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

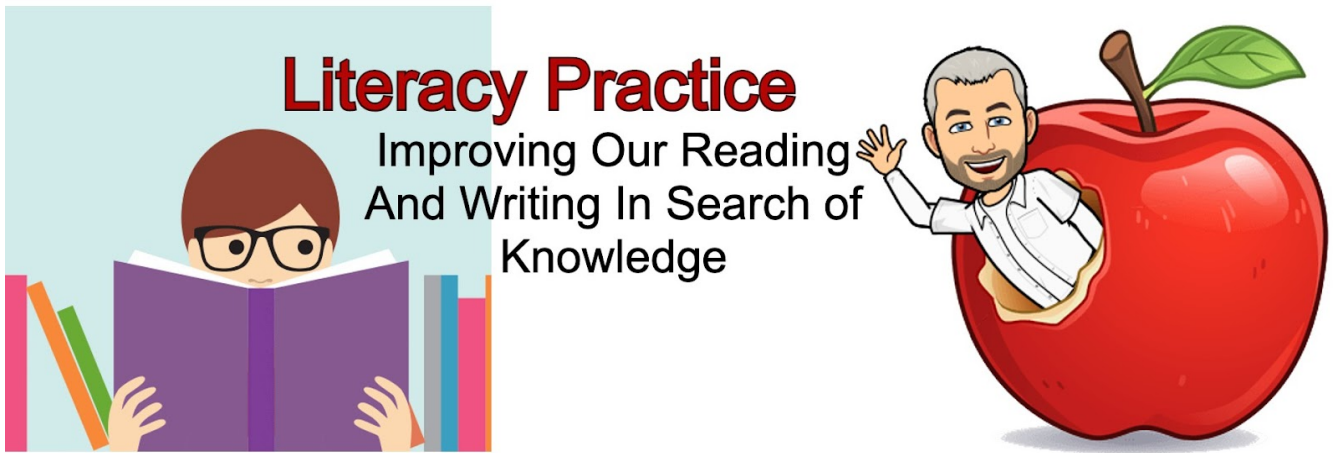
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/mass-versus-weight/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words describing the difference between mass and weight.

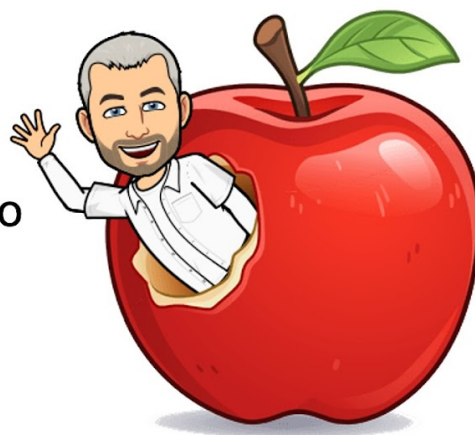
Name: _____

Date: _____



Applying Lab

Proving That We Can Do It Ourselves



Activity: Are Double-Stuffed Oreos Really Double-Stuffed?

Directions: Follow the instructions below to determine whether or not double-stuffed Oreos are really double-stuffed.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Supplies You Will Need:

To complete this lab you will need a scale. It would be best to use a precision scientific scale. If you don't have such a scale, you can purchase one for very little money on HandsomeScienceTeacher.com. Alternatively, you can also use a kitchen scale or a bathroom scale. A kitchen scale will be more precise than a bathroom scale.

You will also need a package of regular Oreos, a package of double-stuffed Oreos, and a butterknife.

Problem:

A horde of angry naked mole rat zombies have awakened from a slumber placed on them long ago. Unlike human zombies, naked mole rat zombies do not eat brains. They eat the frosting from Oreo cookies. These hordes have begun to cover the Earth and if their insatiable hunger for Oreo cookie frosting isn't satisfied soon, they will destroy all of civilization.

You have been assigned by the President to lead the team responsible for feeding the naked mole rat zombies. Being the efficient and smart scientist that you are, you have decided to use double-stuffed Oreos instead of regular Oreos. This is because Oreo claims their double-stuffed cookies have twice as much frosting as their regular cookies.

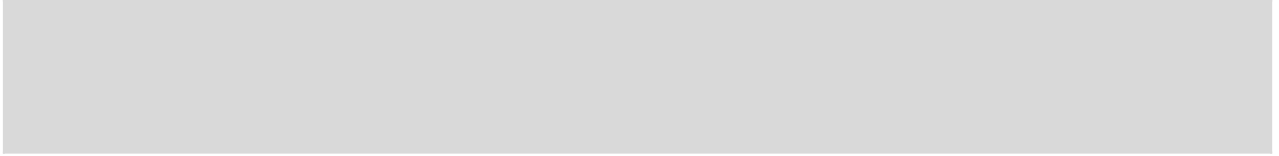
Before your team begins though you need to know if these claims are true. Your job is to find out whether or not Oreo is telling the truth. To do this, you will need to calculate the mass of the frosting found in each type of cookie (single-stuffed and double-stuffed).

Plan And Carry Out An Investigation

Scientists must plan and then carry out investigations. To do this, they first think about a problem that they are trying to solve and then come up with a detailed step-by-step plan.

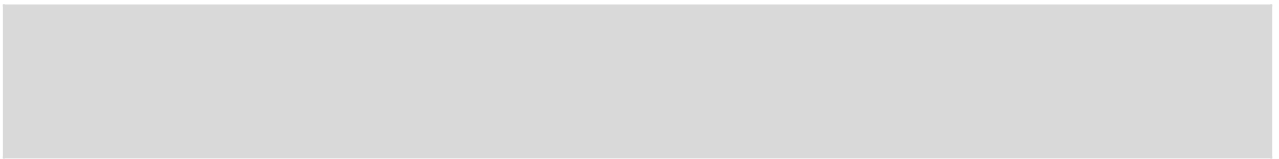
The Problem:

Restate in your own words the problem that you are trying to solve.



Brainstorm:

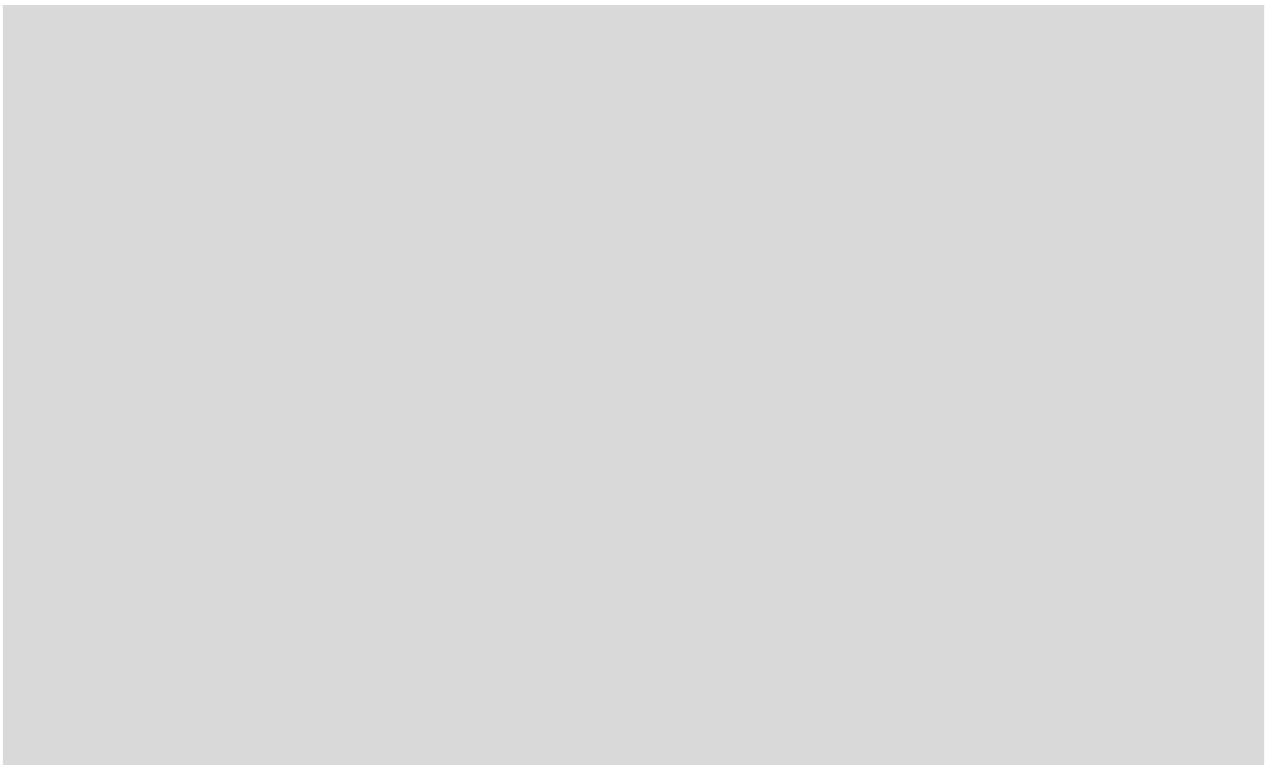
How can you solve this problem? How will you determine whether or not the mass of double-stuffed Oreos is twice that of single-stuffed Oreos?



Write Your Procedures:

Before you carry out your investigation it is important to write detailed step-by-step instructions. This is your experiment. You are the lead scientist. This means that you and only you can decide how many steps your procedures will include. Just make sure that your steps are very detailed so that anyone else could follow them and get the same result as you.

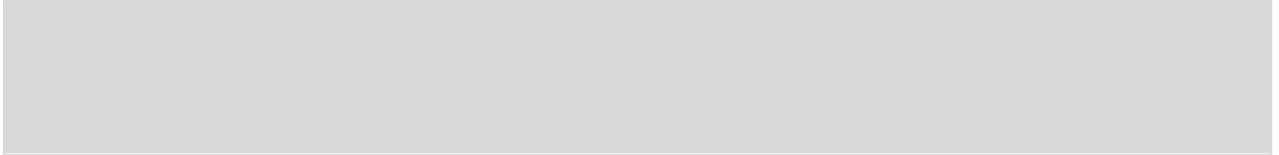
Write detailed step-by-step instructions for the experiment you will perform:



Record Your Results:

After completing your experiment it is important to record accurate results. Use the space below to record your results.

What is the mass of the frosting of a regular (single-stuffed) Oreo cookie?

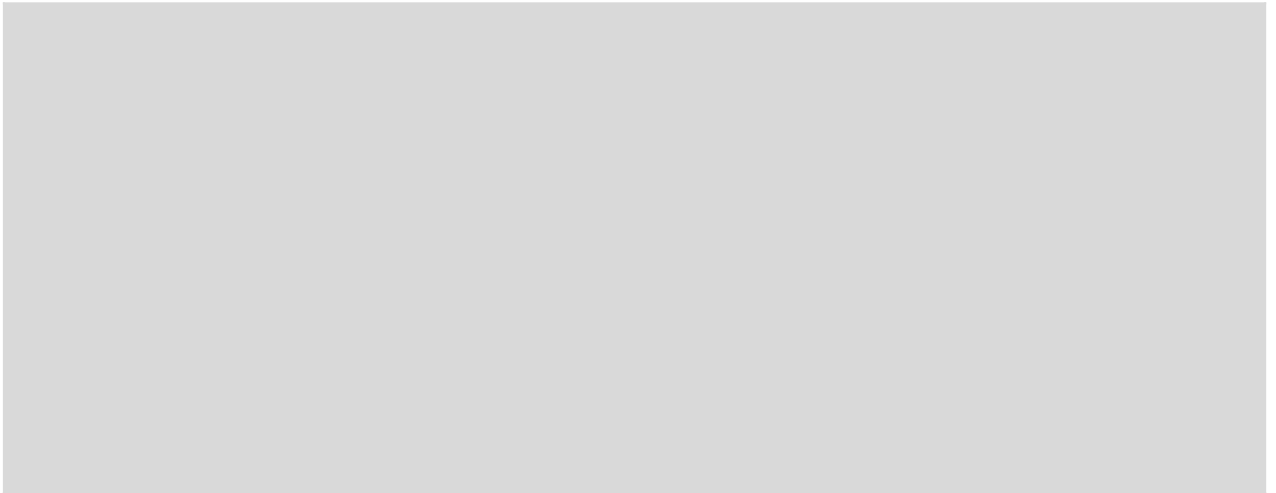


What is the mass of the frosting of a double-stuffed oreo?



Draw Conclusions Based on Evidence:

If Oreo's claims are true, then your second measurement should be exactly twice as large as your first measurement. What did you discover? Is Oreo telling the truth about their cookies being double stuffed? Support your answer with evidence from your own experimentation.



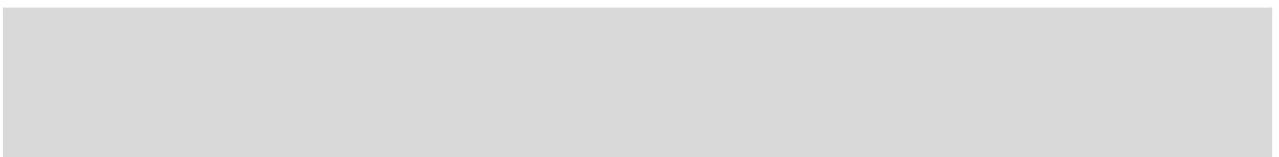
Final Questions:

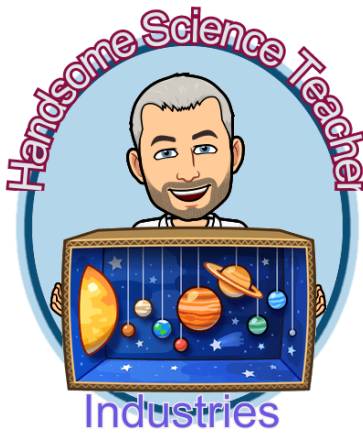
Answer each question using complete sentences.

1. **What does weight measure?**



2. **What does mass measure?**





Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





Volume

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn how to calculate the volume of various objects, including those with regular and irregular shapes.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is volume?
- How do you calculate the volume of a regular shaped object?
- Most objects are not regularly shaped. How do we calculate their volume?
- Water Displacement
- The Archimedes Principle

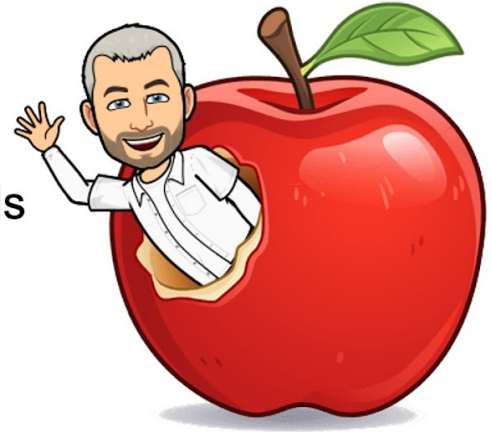
Name: _____

Date: _____



Discovering Lab

Learning Through Hands On Activities



Activity: Discovering Volume

Directions: Follow the steps below to discover how what volume is, and how it is calculated.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about volume

Step 1: Discovering that objects take up space.

1. Fill a sink halfway up with water.
2. Using a dry-erase marker, carefully mark the level of the water.
3. Find objects around your home that are waterproof, like bowling balls, rocks, or toys. Add them to the water.
4. Observe what happens to the level of water.

What happened to the water level, when you added items to the sink?

Why do you suppose this happened?

Step 2: Calculating how much space an object takes up

In the last experiment you observed that objects take up space and that when we add these objects to water the space they take up causes the water level to rise.

Scientists use the word "volume" to refer to how much space an object takes up. Now we are going to learn some methods that you can use to calculate how much space an object occupies or takes up in the Universe.

1. Find an object in your home that is square or rectangular. Such as a box.
2. To calculate the volume of this object, we need to measure its width, height, and length. Scientists use centimeters when they take measurements like this.
3. How many centimeters long is your object?

4. How many centimeters wide is your object?

5. How many centimeters tall is your object?

6. Volume (or how much space an object takes up) is measured by multiplying the width times the length times the height. ($W \times L \times H$).

7. Calculate the volume of your object by using this formula. $V=W \times L \times H$

Step 3: Water Displacement

Most objects are not square-shaped, and as such, we can't use the formula described earlier. It would simply be too difficult. How then do we calculate the volume of these objects?

Based on the first experiment you did, can you think of a way we might cheat? In the first experiment, we observed that water is displaced when we drop objects into it. How do you think we might use this fact to our advantage? How might we use water displacement to measure the volume of an object?

To learn how to use water displacement to calculate volume, fill a graduated cylinder with water. A graduated cylinder has small lines on the side. Take note of the water level. Then add a rock or marble to the graduated cylinder and observe how much the water increases.

Note: If you do not have access to a graduated cylinder you can purchase one from HandsomeScienceTeacher.com. A viable alternative would also be a graduated measuring cup used for cooking.

HandsomeScienceTeacher's Homeschool Science Curriculum For Grades 5-8

1. What happens to the level of water when you add a rock or marble to the graduated cylinder?

2. Did you notice that it is possible to measure the amount of water that is **displaced** by the irregularly shaped rock?

Example: If the water level started at 20 ml and then went up to 26 ml, then the water would have increased by 6ml. In your own experiment how much did the water go up?

3. How do you think this water displacement might relate to volume?

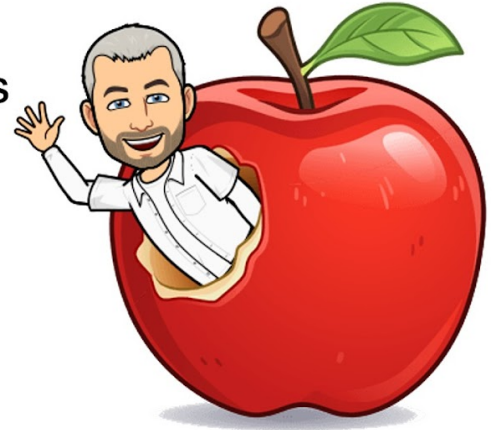
Final Questions:

Remember to answer all your questions using complete sentences.

1. What is volume?

2. What is the formula for calculating the volume of regular shaped objects?

3. How can we calculate the volume of irregular shaped objects?



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

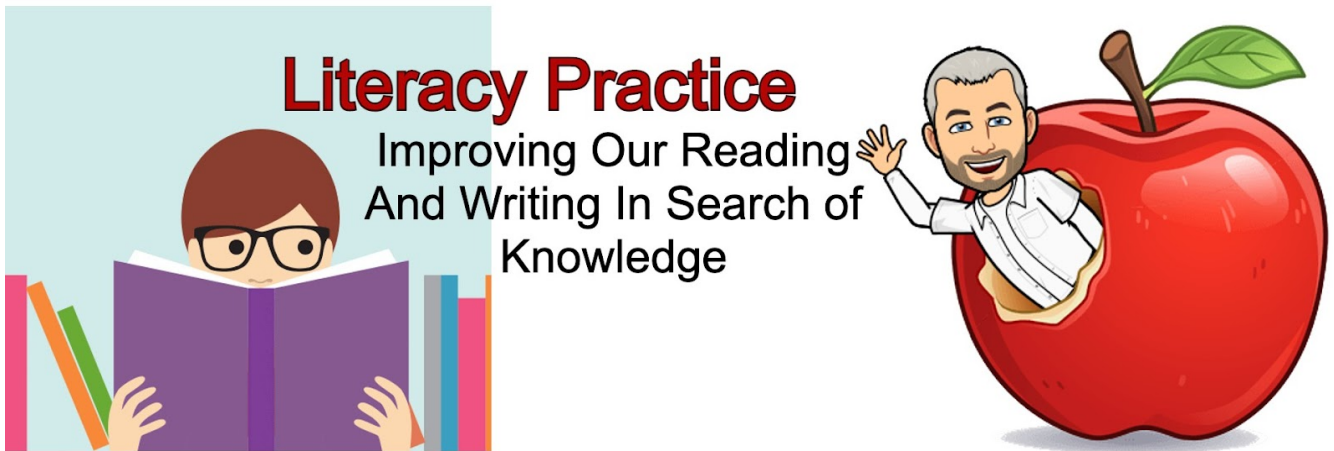
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/the-archimedes-principle/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining how Archimedes discovered water displacement, and what water displacement tells us about the volume of an object.

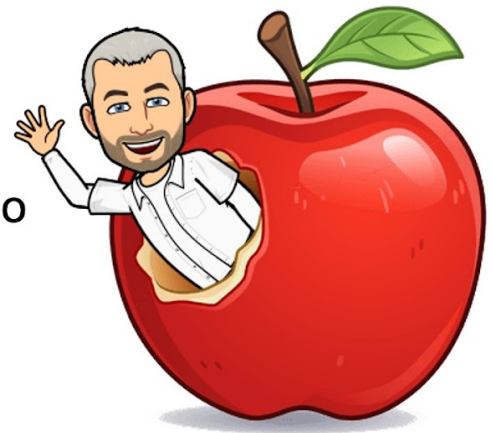
Name: _____

Date: _____



Applying Lab

Proving That We Can Do
It Ourselves



Activity: Applying Volume By Solving Problems

Directions: Follow the instructions below to measure the volume of several objects.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To demonstrate your understanding of what volume is, and how it is calculated.

Regular-Shaped Objects

Step 1:

Collect a ruler or tape measurer and three regular (square) shaped objects.

Step 2:

Obtain the volume of these three objects.

Object # 1: _____

Draw a picture of your object:

Width: _____ mm.

Height: _____ mm.

Length: _____ mm.

Volume: Width X Height X Length = _____ mm³.

Object # 2: _____

Draw a picture of your object:

Width: _____ mm. Height: _____ mm. Length: _____ mm.
Volume: Width X Height X Length = _____ mm³.

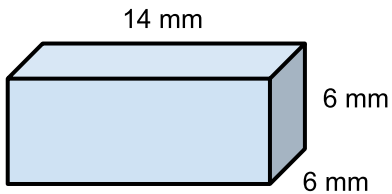
Object # 3: _____

Draw a picture of your object:

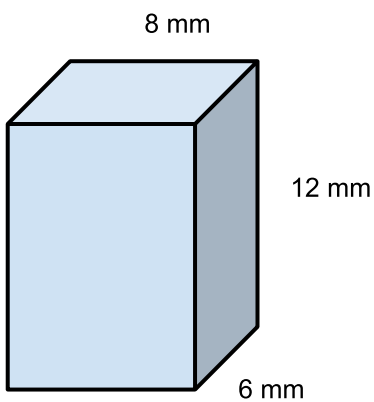
Width: _____ mm. Height: _____ mm. Length: _____ mm.
Volume: Width X Height X Length = _____ mm³.

Step 4:

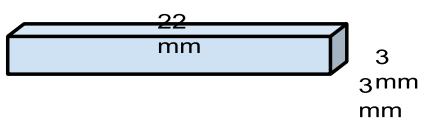
Calculate the volume of the objects shown.



Volume: Width X Height X Length = _____ mm³.



Volume: Width X Height X Length = _____ mm³.




Volume: Width X Height X Length = _____ mm³.

Irregular-Shaped Objects

Use a graduated cylinder to calculate the volume of three irregularly shaped objects.

Object # 1: _____

Draw a picture of your object:

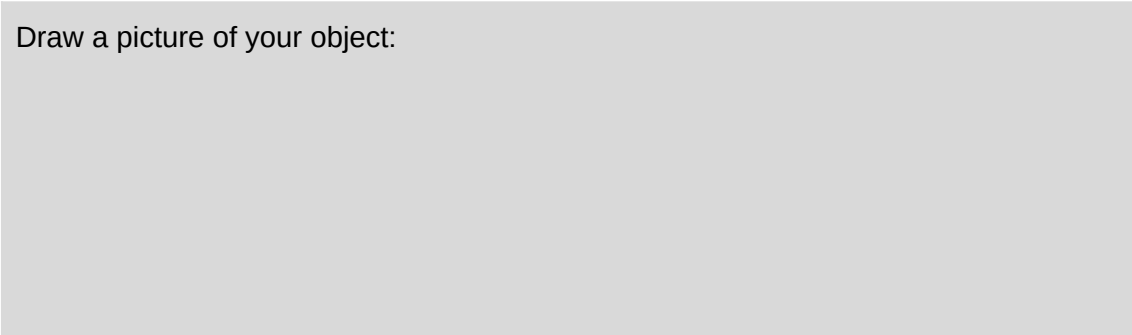


How much water was displaced: _____ ml

What is the volume of this object: _____ ml

Object # 2: _____

Draw a picture of your object:

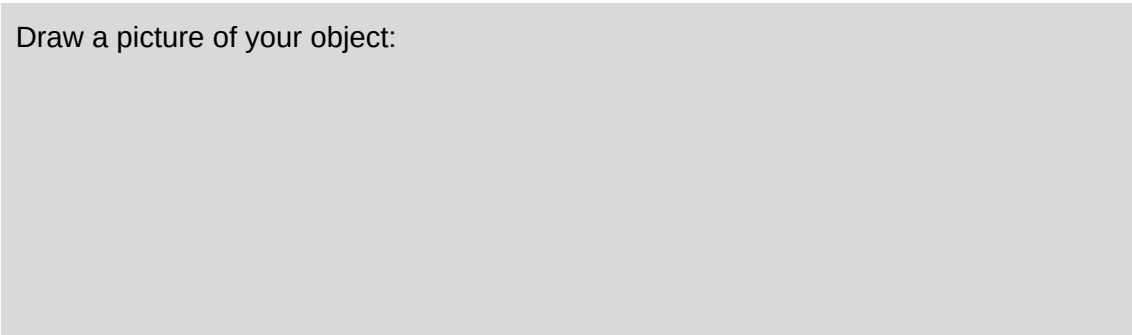


How much water was displaced: _____ ml

What is the volume of this object: _____ ml

Object # 3: _____

Draw a picture of your object:



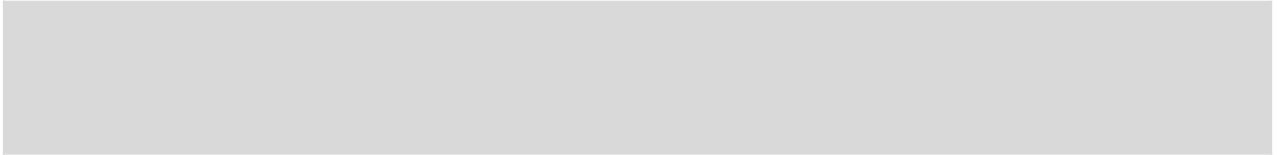
How much water was displaced: _____ ml

What is the volume of this object: _____ ml

Final Questions:

Answer each question using complete sentences.

1. **What does mass measure?**



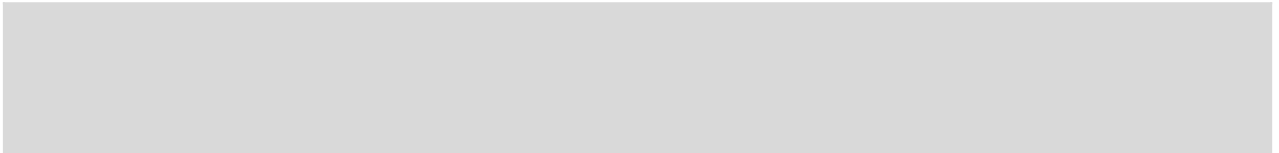
2. **What does volume measure?**




3. **How is volume similar to mass?**



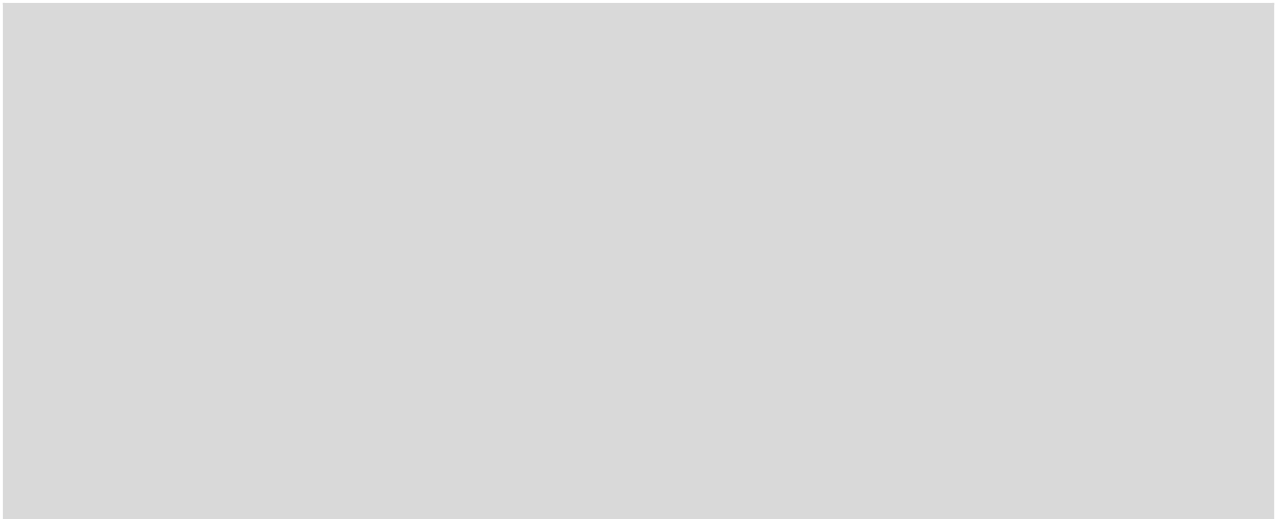
4. **How is volume different than mass?**

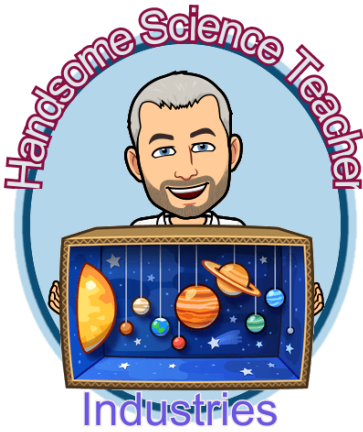


5. **What is the formula for the volume of regular-shaped objects?**



6. **Draw a picture of a regular-shaped object such as a box. Label the box with a fictional length, width, and height. Then using the formula for volume calculate the volume of your box.**





Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

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Density & Natural Sorting

What I Will Be Learning In This Mastery Badge:

In this mastery badge you will learn how substances sort themselves naturally and how this has affected the Earth.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is density?
- How is density calculated?
- What are the units of measurement for density?
- How does density affect how substances sort themselves naturally?
- How do you think density might affect the layers of the Earth?

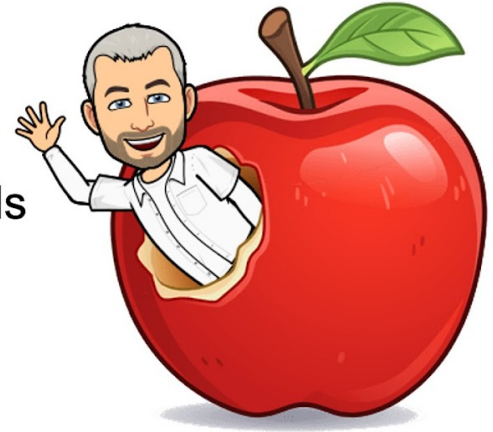
Name: _____

Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering Density

Directions: Follow the steps below to discover how density affects substances and how they sort themselves naturally.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how density affects substances.

Supplies: For this lab you will need vegetable oil, food coloring, and a water bottle.

Step 1: Mixing Substances of Different Densities

Water and oil are two substances that have very different densities. Don't worry about what density is right now. We will talk about this later on. For now, just know that oil is less dense than water.

Make A Prediction:

What do you think will happen when you mix oil and water?

Color your Water:

Before we mix these two substances together, let's add some color to the water, so that the results will be more obvious.

1. Take a water bottle and empty half the contents, leaving it half-full of water.
2. Add 2-3 drops of food coloring to the remaining water in your water bottle.

Experiment:

Now, let's mix the oil and water and see how accurate your prediction was.

3. Carefully pour vegetable oil into the water bottle, until it is full. Your water bottle should now be half full of water and half full of oil.
4. Turn your bottle upside down and observe what happens.

Describe what happens as you turn your water bottle over. What did the oil and water do?

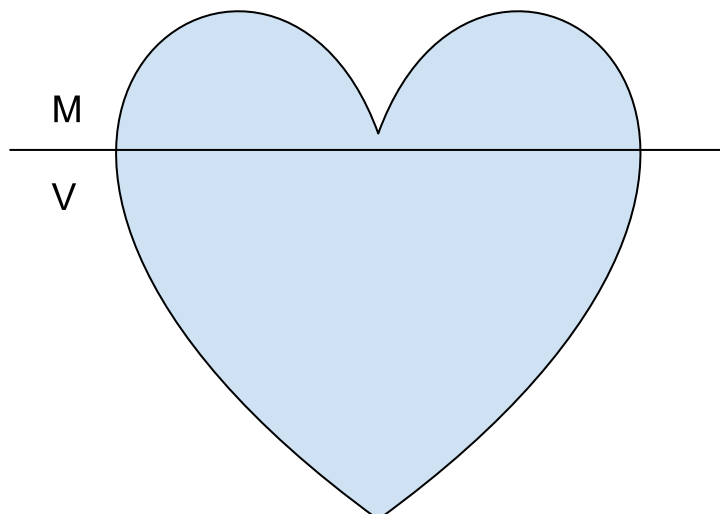
Final Questions:

Remember to answer all your questions using complete sentences.

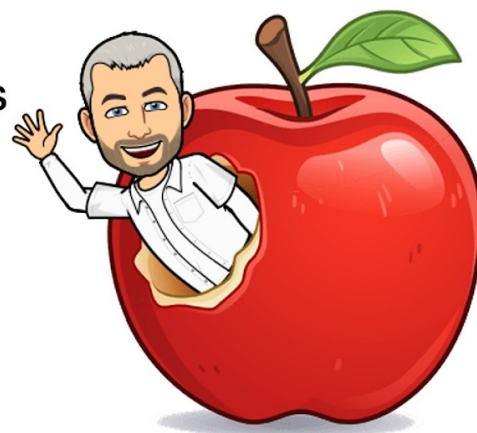
1. What is Mass? (Review Question)

2. What is volume? (Review Question)

3. What happens when substances of different densities are mixed together? What do they do?



This Heart Will Be Important Later. It is a helpful way to remember the formula for density. We will talk about why in the video.



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

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The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

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Recording Your Learning

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Ten Things I Learned From This Video

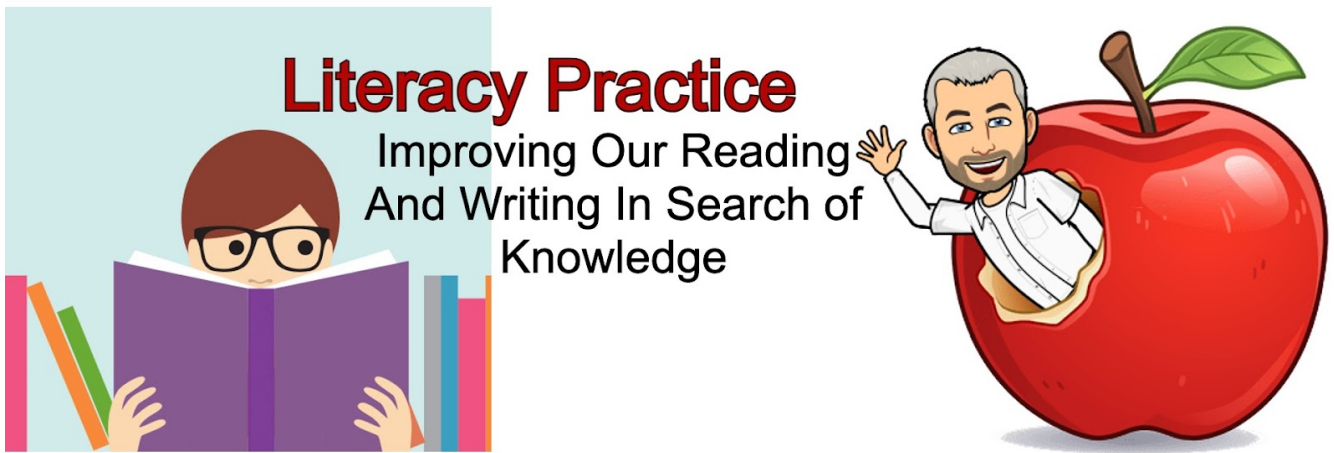
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- 10.

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Activity: Reading And Writing

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



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2. **Practice Writing To Communicate**
Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/density/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Writing Prompt:

Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

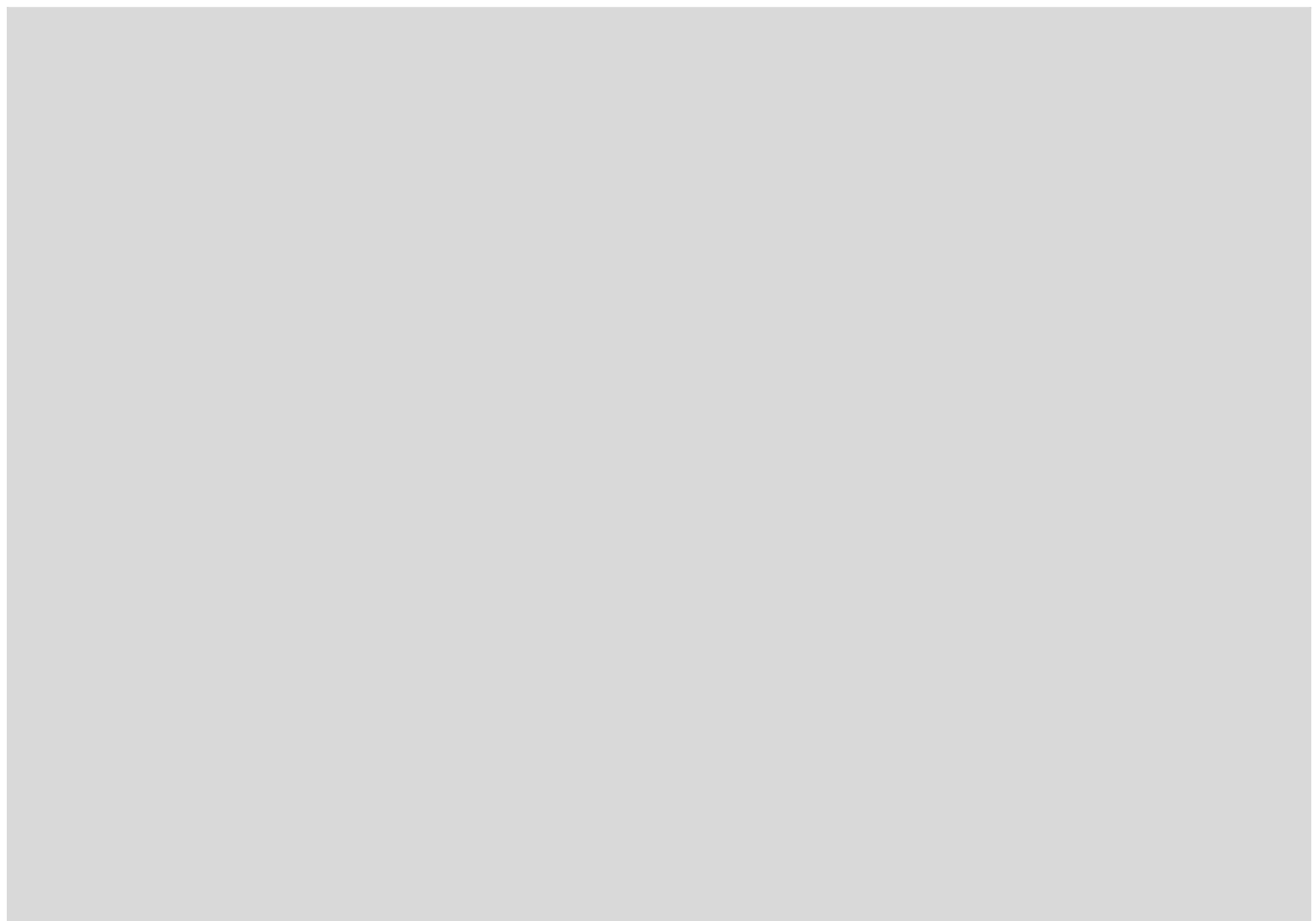
Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining what density is and how it is calculated.



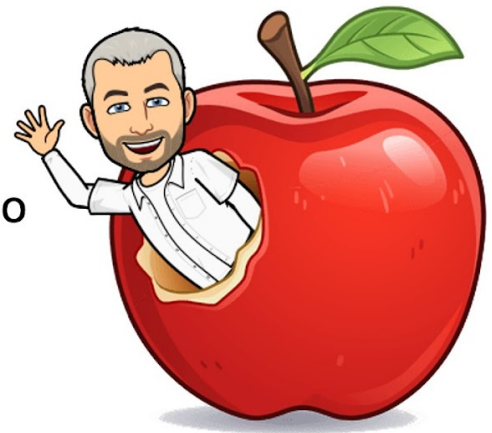
Name: _____

Date: _____



Applying Lab

Proving That We Can Do It Ourselves



Activity: Applying Density By Solving Problems

Directions: Follow the instructions below to measure the density of several objects.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To demonstrate your understanding of what density is, and how it is calculated.

Calculate The Density of An Object of Your Choice

Step 1: Select an object from your home.

Calculate The Mass:

Remember that to calculate the mass, you need to weigh the object using a scale. What is the mass of your object?

Calculate The Volume:

Is your object regularly shaped or irregularly shaped? What process will you use to calculate its volume?

Calculate The Density:

Use the formula **Density=Mass / Volume (mass divided by volume)** to calculate the density. What is the density of your object?

Final Questions:

Answer each question using complete sentences.

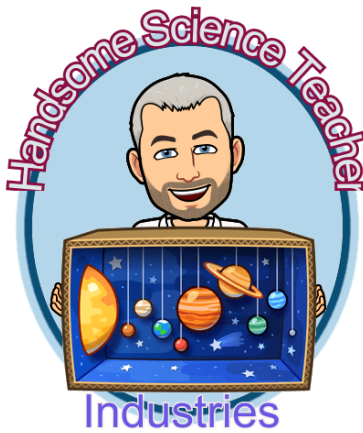
1. A block of aluminum occupies a volume of 15.0 mL and has a mass of 40.5 g. What is its density?

2. Mercury metal is poured into a graduated cylinder that holds exactly 22.5 ml. The mercury used to fill the cylinder weighs 306.0 g. From this information, calculate the density of mercury.

3. A rectangular block of copper metal weighs 1896 g. The dimensions of the block are 8.4 cm by 5.5 cm by 4.6 cm. From this data, what is the density of copper?

4. Calculate the density of sulfuric acid if 35.4 mL of the acid weighs 65.14 g.

5. A block of lead has dimensions of 4.50 cm by 5.20 cm by 6.00 cm. The block weighs 1591 g. From this information, calculate the density of lead.



Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.

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Buoyancy - A STEM Lab

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about buoyancy. We will also use the engineering process to design and build a sailing vessel.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Density: A review
- Wind: A review
- Why do things float?
- What is buoyancy?
- How is buoyancy calculated?
- Design, build, and test a boat.

Name: _____

Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering Buoyancy

Directions: Follow the directions below to learn about buoyancy



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about buoyancy

You have been hired by a t-rex to build a sailboat. He claims he needs this boat so that he can visit his grandmother in New York City, and promised he most certainly isn't trying to escape the island where scientists created him. He also promised so very earnestly that when he arrives in New York he most certainly will NOT eat any of the people there.

And, we know he is telling the truth because he held his little tiny t-rex arm up in the air as he promised. So, go ahead and totally build that hungry-looking t-rex a boat and send him to one of the most populated cities in the world.

Supplies For This Lab

For this lab, you are only limited by your imagination. You are allowed to use any supplies that you have access to at home, or that you can talk your parents/guardians into getting for you. Keep in mind though as you plan your boat that you will actually have to build it later on, so it is best to keep your design simple and inexpensive.

Design Your Sailboat

We have not yet studied buoyancy nor have we discussed the concepts around building a good sailboat, but that is okay. Before continuing with this mastery badge, you are first going to try your best to build and test a sailboat. Later we will learn about buoyancy and then use the engineering process to improve your design.

Your Sailboat Must Carry A Passenger

Your sailboat should be able to carry a small load or weight, which will represent the t-rex. If you have an actual t-rex figurine that would be amazing. If not, that is okay, use a pencil or some other small weight to represent your passenger.

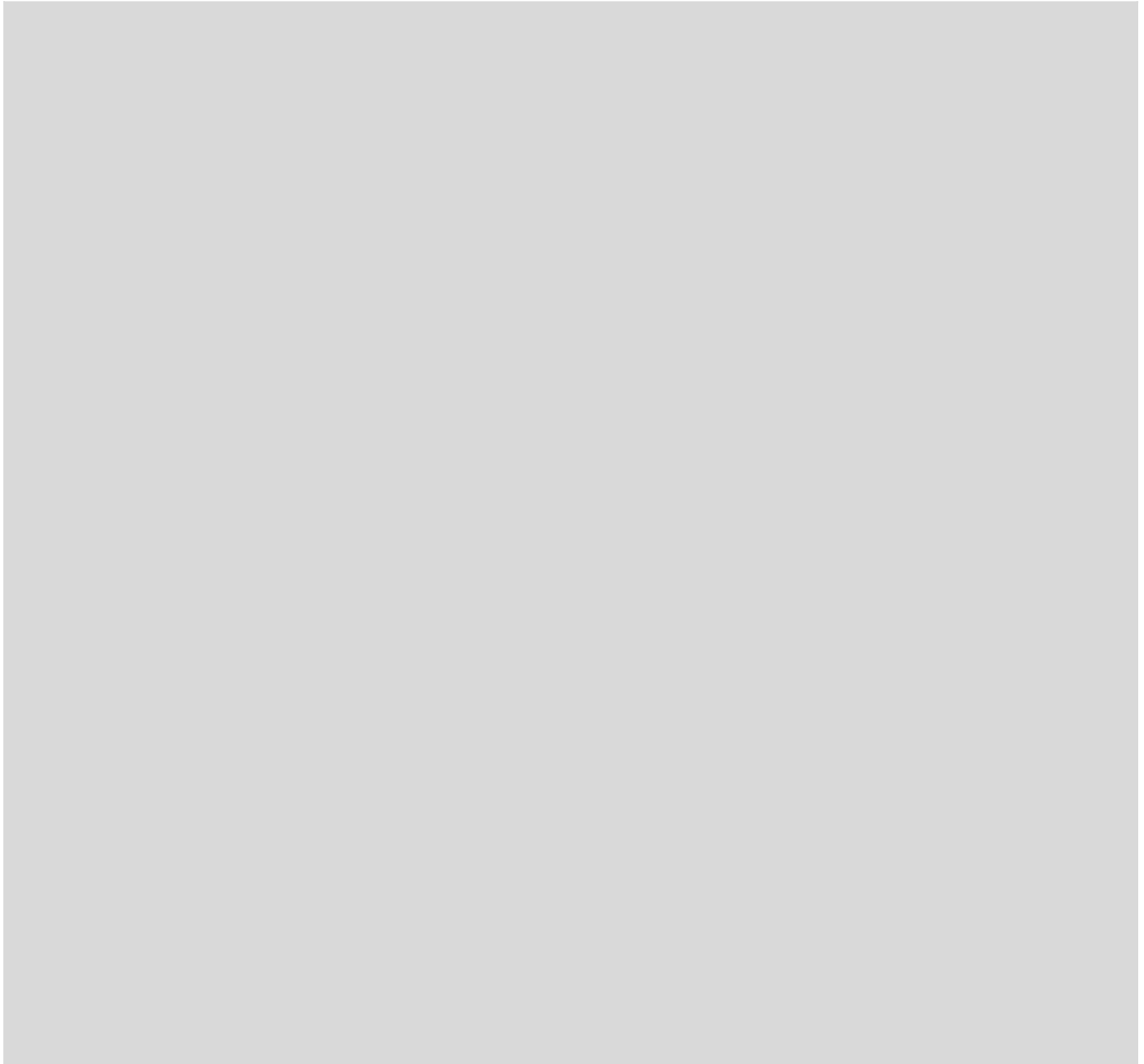
Plan Your Design

Engineers are a special kind of scientist that create ideas and inventions to solve problems. When solving a new problem they always start by first planning. They often use computer programs for this, such as Autocad. Before computers, though they did this planning using paper and pencil, which is what we will be doing.

Before building your sailboat, you need to first design it. Draw a diagram showing how you will build your sailboat. Label each part of your diagram showing the materials that you intend to use. Remember that you will actually be building this, so it is best to keep your design simple.

Important: This is a sailboat so don't forget to include a sail in your design.

Diagram and label your boat in the space provided.



Put Your Design Into Action

Now that your design is completed, it's time to build it. Using the supplies you specified in your design build your sailboat. If you find that you want to alter your design, change the diagram first, and then continue building. Make sure that when you finish, your boat and your diagram match.

Test Your Design

Take your boat somewhere safe where you can test it. Ideal locations would be a small stream, a pond, or a swimming pool. Alternatively, you can also test your design in a bathtub. Be very careful and be safe around water. Make sure you have an adult with you.

How well does your boat float? Did it continue to float until you removed it from the water, or did it begin to sink? Was your boat waterproof?

Was your boat balanced? Did it stand upright or tip toward the side?

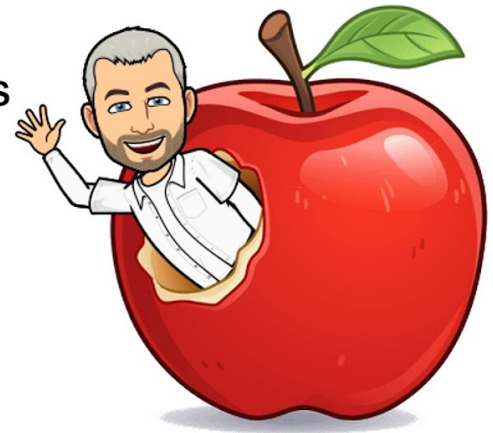
Apply wind to your sail and observe the results. A fan, leaf blower, or hair dryer are good solutions for creating wind, but be very careful. Water and electricity do not mix!

MAKE SURE AN ADULT IS WITH YOU AT ALL TIMES!

Describe what happened when you applied wind to your boat. How well did it sail? Did it remain upright or did it tip over?

The Engineering Process

Engineers are always improving their designs. No matter how good an idea or technology is, there is always room for improvement. What could you do to improve the design of your sailboat?



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

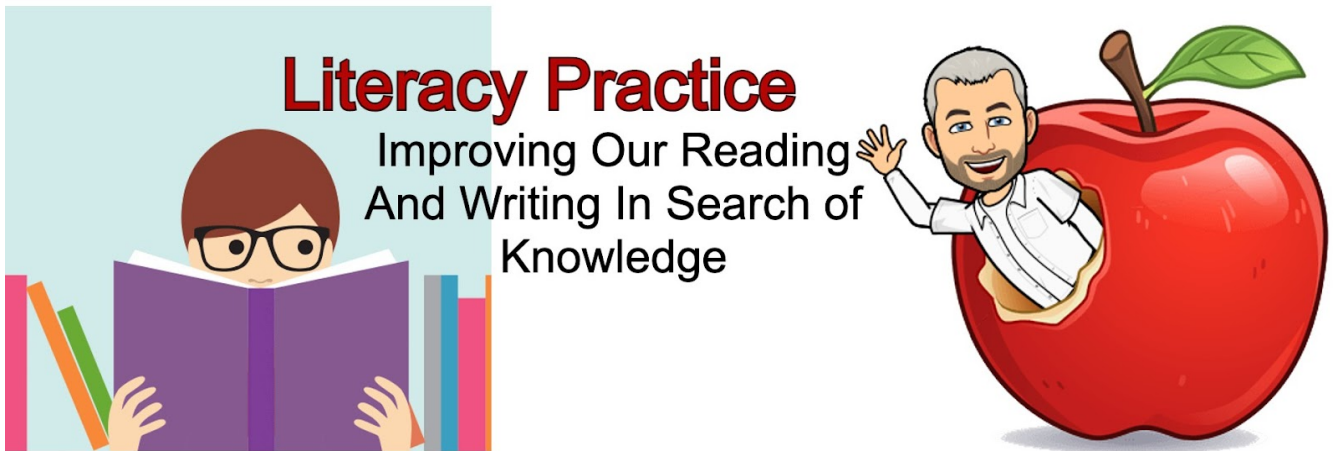
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Lunar Phases

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/buoyancy-the-archimedes-principle/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write three paragraphs in your own words explaining what buoyancy is and what causes things to float.

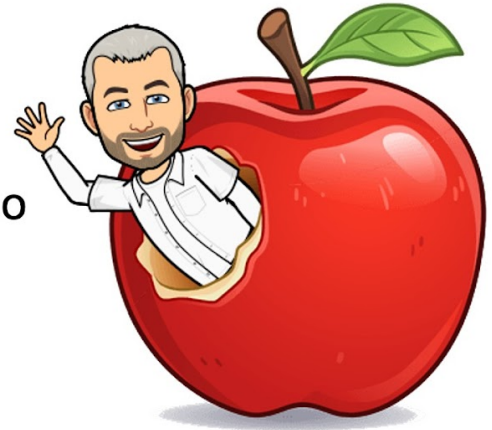
Name: _____

Date: _____



Applying Lab

Proving That We Can Do It Ourselves



Directions: Follow the steps outlined below to create an improved sailboat design.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To use the engineering process in order to create an improved sailboat.

Remember that hungry-looking t-rex that you sent to New York City? Well, after he arrived he picked up a phone and called some of his buddies back on the island. Which you have to admit is pretty impressive considering that his little arms don't reach up to his face. He probably used speakerphone.

While on the phone he told his three t-rex friends about the delicious peop, err I mean he told them that all of their grandmas are also sick and that they definitely need to also visit New York City.

Thus, you have been hired to build a new and improved sailboat that can carry three times as much weight as your first design.

Supplies For This Lab

For this lab, you are only limited by your imagination. You are allowed any supplies you have access to at home, or that you can talk your parents/guardians into getting for you. Keep in mind though as you plan your boat that you will actually have to build it, so it is best to keep your design simple and inexpensive.

Design Your Sailboat

Now that we have studied buoyancy you are better equipped to build an improved design. More importantly, you now have experience building boats. You have already built and tested an earlier version of your sailboat.

Your goal is to improve your design.

Your Sailboat Must Carry three Passengers

Your sailboat should be able to carry a small load or weight, which will represent the three t-rexes. If you have three actual t-rex figurines that would be amazing. If not, that is okay, use pencils or other small weights to represent your passengers. Make sure that your weight is three times heavier than it was when you tested your first boat.

Plan Your Design

Engineers are a special kind of scientist that create ideas and inventions to solve problems. They do this by using the engineering process. You have already built one design. How can you improve it? How can you make your design better?

Diagram and label your improved boat design in the space provided.



Build Your Design

Now that your design is complete, it's time to build it. Using the supplies you specified in your design build your sailboat. If you want to alter your design, change the diagram first, and then continue building. Make sure that when you finish, your boat and your diagram match.

Test Your Design

Take your boat somewhere safe where you can test it. Ideal locations include a small stream, a pond, or a swimming pool. Alternatively, you can also test your design in a bathtub. Be very careful and be safe around water. **Make sure you have an adult with you.**

How well does your boat float? Did it continue to float until you removed it from the water, or did it begin to sink? Was your boat waterproof?

Was your boat balanced? Did it stand upright or tip towards the side?

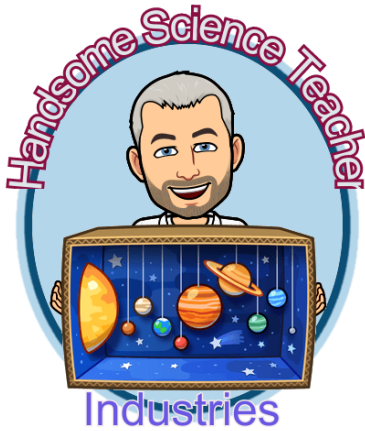
Apply wind to your sail and observe the results. A fan, leaf blower, or hair dryer are good solutions for creating wind, but be very careful. Water and electricity do not mix!

MAKE SURE AN ADULT IS WITH YOU AT ALL TIMES!

Describe what happened when you applied wind to your boat. How well did it sail? Did it remain upright or did it tip over?

The Engineering Process Is Ongoing

Engineers are always improving their designs. This is a cycle that never ends. Which is why companies are constantly releasing new and improved versions of their products. No matter how good an idea or technology is, there is always room for improvement. What might you do to improve the design of your sailboat even further?



Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





Newton's First Law of Motion

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about Newton's First Law of Motion.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Issac Newton
- The Laws of Motion
- What is Inertia?
- The First Law of Motion
- Objects at rest, objects in motion.

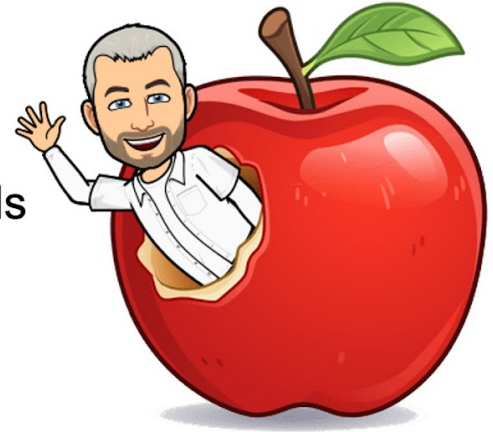
Name: _____

Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering Newton's First Law of Motion

Directions: Follow the directions below to learn about buoyancy



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about Newton's First Law of Motion

Science provides us with tools for learning about how the Universe operates. Sometimes we think of science as a bunch of rules, laws, and theories that we have to memorize. But what it really is, is a way of making good and reliable discoveries. In order for a discovery to be valid it must be repeatable, and it must be based on solid, unbiased principles. Our goal is never to try to obtain an outcome we want, but instead to simply see what happens and record the results truthfully.

In this lab, you are going to work to discover how objects move through the Universe. A long time ago, another scientist named Issac Newton did similar experiments and discovered what he later named "Newton's Three Laws of Motion." Today, you will be discovering some of these laws for yourself, and so we will call them _____'s Laws of Motion. (Place your own name on the blank line). Since you are making these discoveries on your own, you get credit for what you find out.

Plan And Carry Out An Investigation

Scientists plan and then carry out investigations. To do this, they first think about a problem that they are trying to solve and then come up with a detailed step-by-step plan.

Problem:

How does motion work?

This seems like a simple enough question, but can you come up with rules that explain why moving things start

moving, and why they stop moving? What causes them to begin moving, and then once they start moving, what causes them to stop?

Hypothesis:

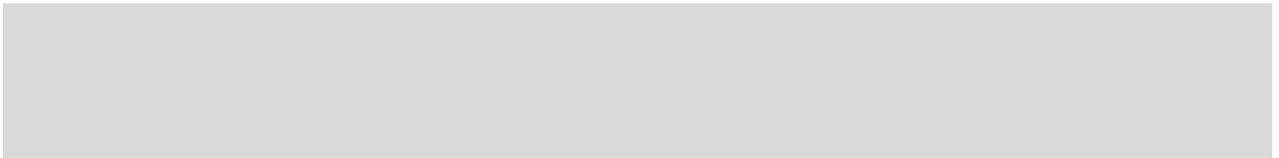
By this point in your life you have seen enough of the world to come up with some educated guesses about why things start moving and why they stop moving.

Based on your experience, create a hypothesis (an educated guess) for what you think causes things to start moving, and what might cause them to stop moving. Record your hypothesis below:



Brainstorm:

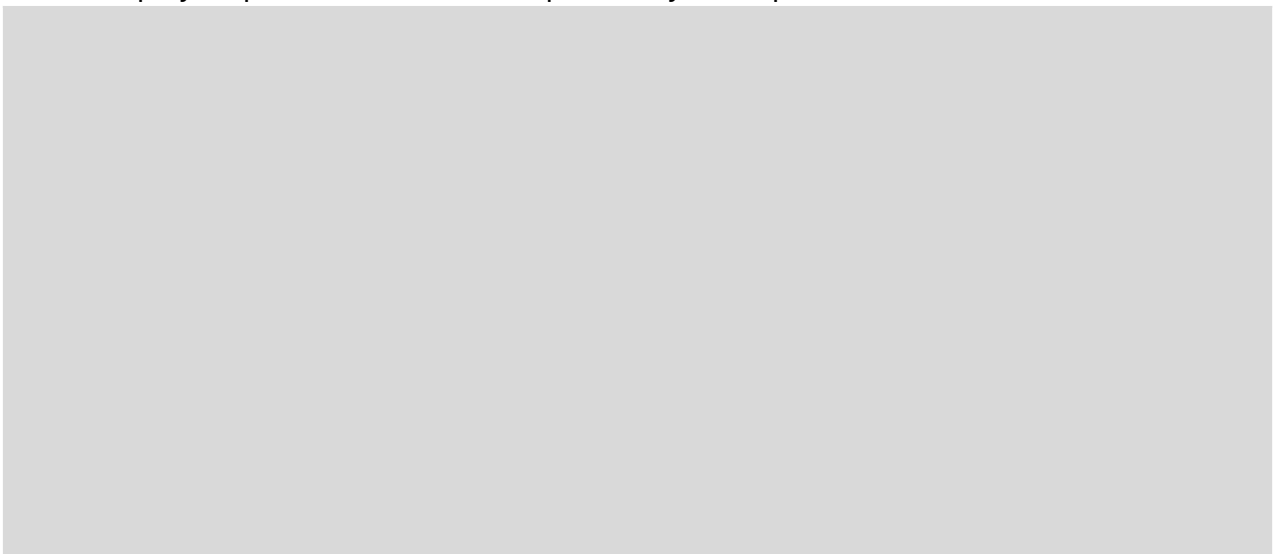
How can you test your hypothesis? If you are uncertain, ask an adult for help. What experiments could you perform to figure out why things start moving, and why they stop moving?



Write Your Procedures:

Before you carry out your investigation it is important to write detailed step-by-step instructions. This is your experiment. You are the lead scientist. Which means that you and only you can decide how many steps your procedures should include. Just make sure that your steps are detailed enough so that someone else can follow them and get the same result as you.

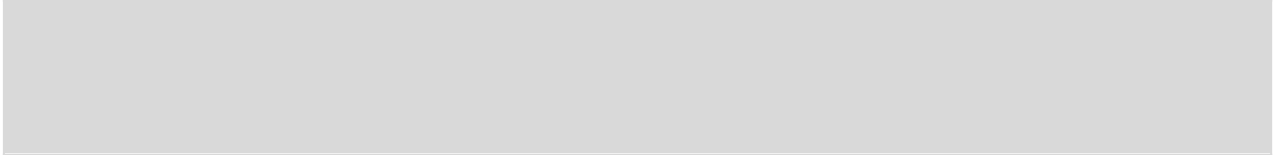
Write detailed step-by-step instructions for the experiment you will perform:



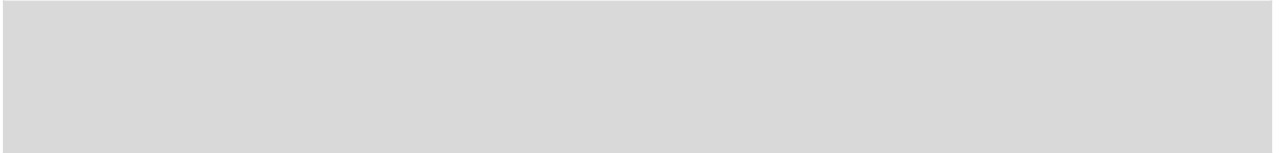
Record Your Results:

After completing your experiment it is important to record accurate results. Use the space below to record your results.

Based on your experimentation, why do things start moving?



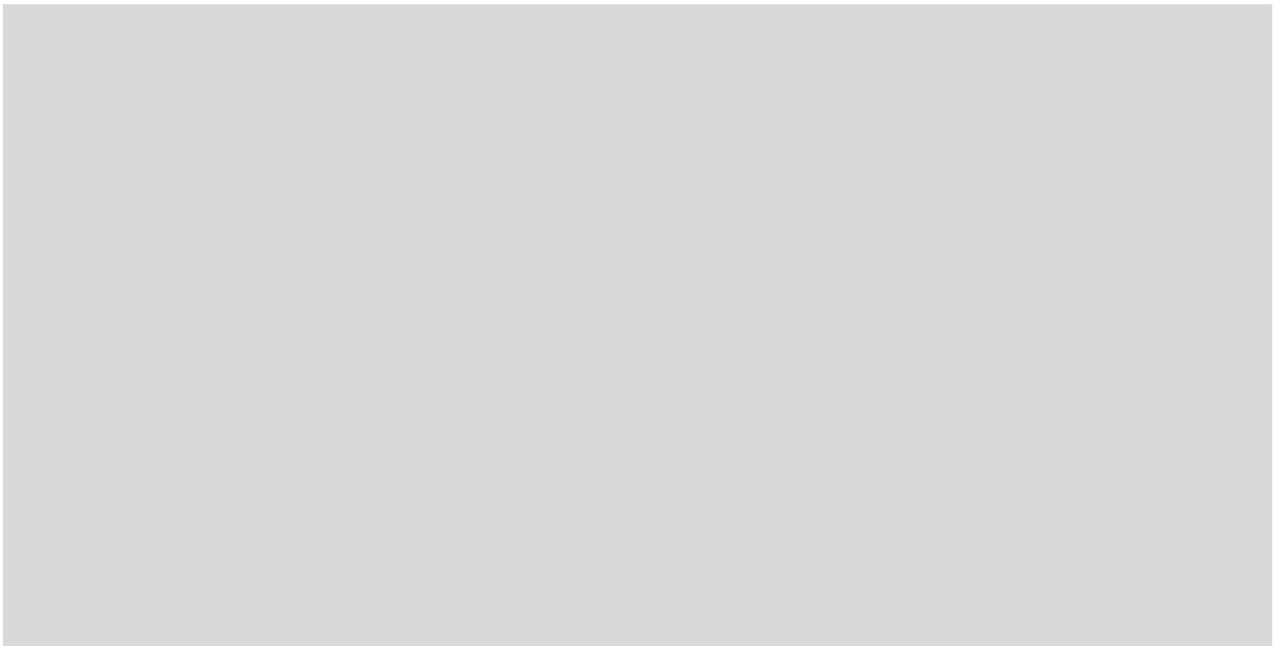
Based on your experimentation, why do things stop moving.

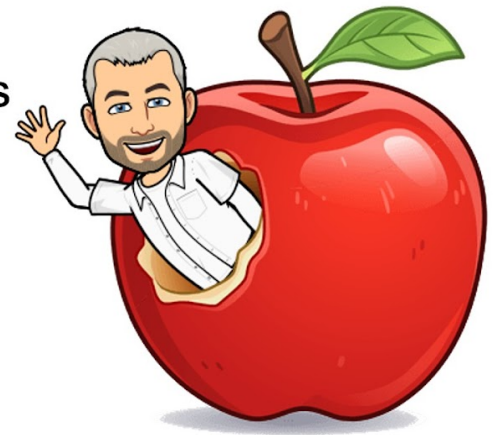


Create Your Own Law of Motion

_____ **'s Law of Motion:**

Write a law that describes what causes things to start moving and what causes them to stop moving. Name the law after yourself, since you discovered it.





Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

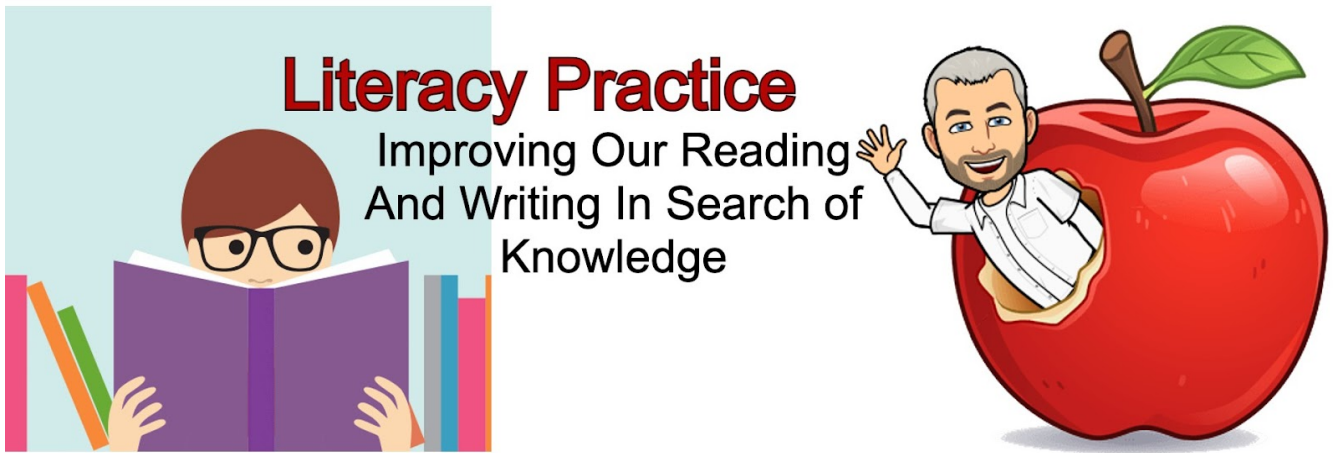
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Lunar Phases

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

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1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/newtons-first-law-of-motion/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining Issac Newton's First Law of Motion.

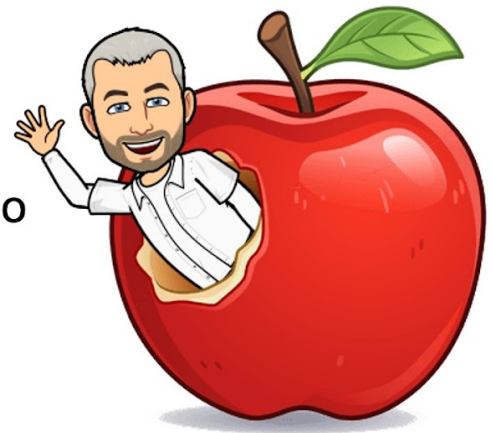
Name: _____

Date: _____



Applying Lab

Proving That We Can Do
It Ourselves



Directions: Follow the steps outlined below to demonstrate your understanding of Newton's First Law of Motion



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To demonstrate your understanding of Newton's First Law of Motion.

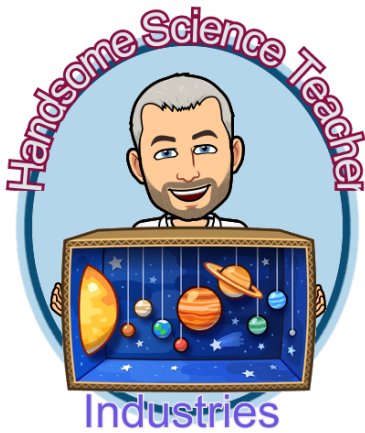
Look up in the sky. What is that? Is it a plane? Is it a bird? No, it's, it's, It's an ASTEROID!"

"We interrupt this science lab sheet with an important announcement. An asteroid is headed toward the Earth. More specifically it is headed toward your town! Everyone should immediately start running in circles screaming. Scientists assure us that this will help."

Since everyone else is currently busy running in circles screaming, you are the only person left to save humanity. What will you do to stop the pending disaster? How can you stop an Asteroid from hitting your town?

Create A Proposal

Write a one-page proposal to your town council explaining what can be done to either stop or alter the course of the Asteroid. In your proposal discuss Newton's First Law of Motion. Explain to the town council what Newton's First Law tells us about object in motion, and how we can use our understanding of this law to save the town.



Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





Newton's Second Law of Motion

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about Newton's Second Law of Motion.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Issac Newton
- The Laws of Motion
- The Second Law of Motion
- How do you calculate acceleration?
- How do you calculate force?
- What is the formula for force?
- Mass and Force affect the rate of acceleration.

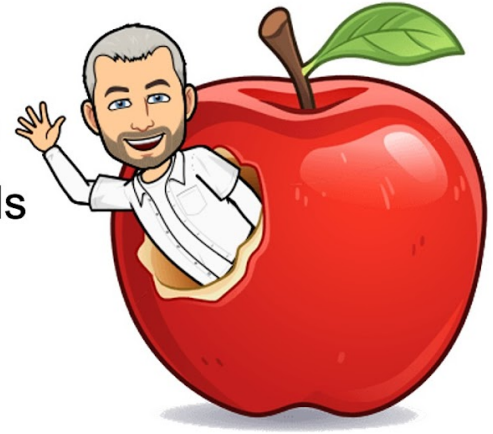
Name: _____

Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering Newton's Second Law of Motion

Directions: Follow the directions below to learn about Newton's Second Law of Motion



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about Newton's Second Law

Measuring The Impact of Force

Issac Newton's second law of motion explains how force and mass affect the acceleration of an object. In this lab we will test his theory and draw our own conclusions about how force and mass affect the movement of objects.

Supplies

For this lab you will need a rubber band, and several small balls of various sizes and weights. Golf balls, ping pong balls, baseballs, and marbles work well.

Applying Equal Force

In this lab, you will be applying a force to various objects and recording how far each object travels. In order to get accurate measurements, it is important that the exact same amount of force be applied to each object. This is very difficult to do with your hands. However, we can get consistent results by using a rubber band. In order to get accurate measurements, make sure that for each trial you hold the rubber band in the exact same way, and that you pull it back the exact same distance. This will ensure that the same amount of force is exerted on each object.

Recording Accurate Data

Good scientists are careful to collect accurate and unbiased data. It is not the job of the scientist to influence the outcome. Instead, we simply want to observe what happens, and then record and interpret the data accordingly.

Applying For To Several Objects

HandsomeScienceTeacher's Homeschool Science Curriculum For Grades 5-8

Select five different round objects (balls) of various sizes and weights. Place each ball on a hard surface and then launch them using a rubber band. Being careful to apply the exact same amount of force on each trial. Measure and record the distance that each ball travels.

Ball Mass	Trial 1	Trial 2	Trial 3
What is the mass of this ball?	How far did the ball travel on this trial?	How far did the ball travel on this trial?	How far did the ball travel on this trial?
What is the mass of this ball?	How far did the ball travel on this trial?	How far did the ball travel on this trial?	How far did the ball travel on this trial?
What is the mass of this ball?	How far did the ball travel on this trial?	How far did the ball travel on this trial?	How far did the ball travel on this trial?
What is the mass of this ball?	How far did the ball travel on this trial?	How far did the ball travel on this trial?	How far did the ball travel on this trial?
What is the mass of this ball?	How far did the ball travel on this trial?	How far did the ball travel on this trial?	How far did the ball travel on this trial?

Graph Your Data

Raw data is important to collect. However, it can be difficult to interpret. One tool that scientists use to identify patterns in data is to create a visual graph. There are many kinds of useful graphs in science and each type tells a different story. For this lab you will create a scatter plot.

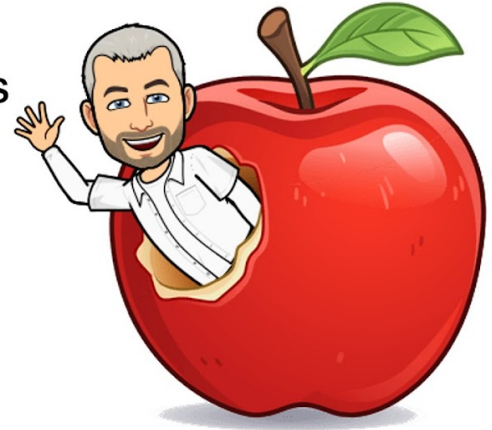
Create a scatter plot with the mass of your objects on the side, and the distance they traveled across the bottom.

Analyze And Interpret Your Data

With your scatter plot completed you now have a tool that you can use to more easily identify patterns.

What patterns do you notice in your data?

Look over your data and identify any apparent patterns. There are no right or wrong answers. What matters is only that your answer is supported by your data. Is there any relationship between the mass and the distance that objects travel? Explain your answer.



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

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Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

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I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

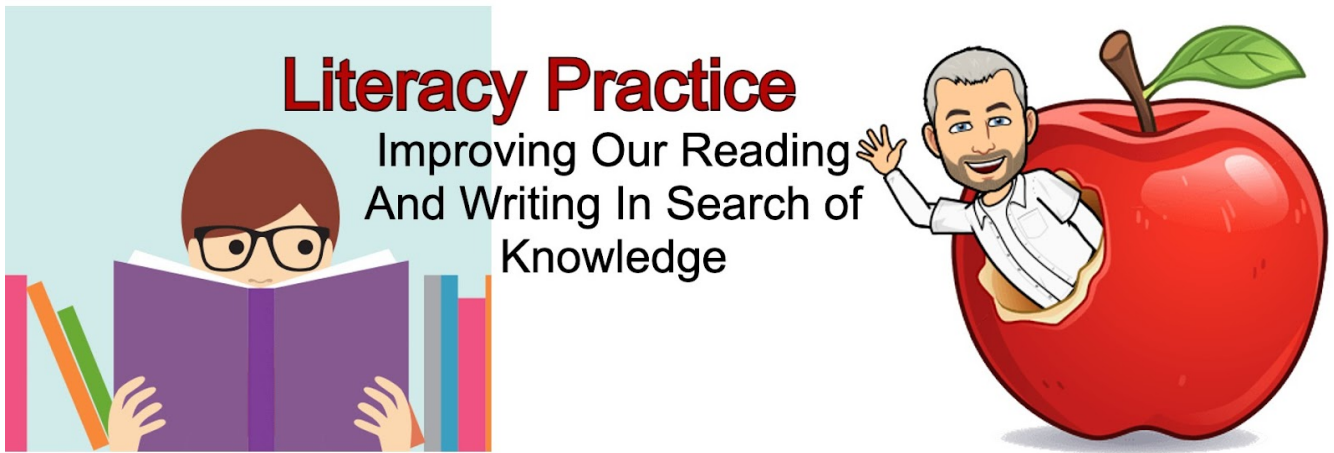
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Lunar Phases

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/newtons-second-law-of-motion/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

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I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

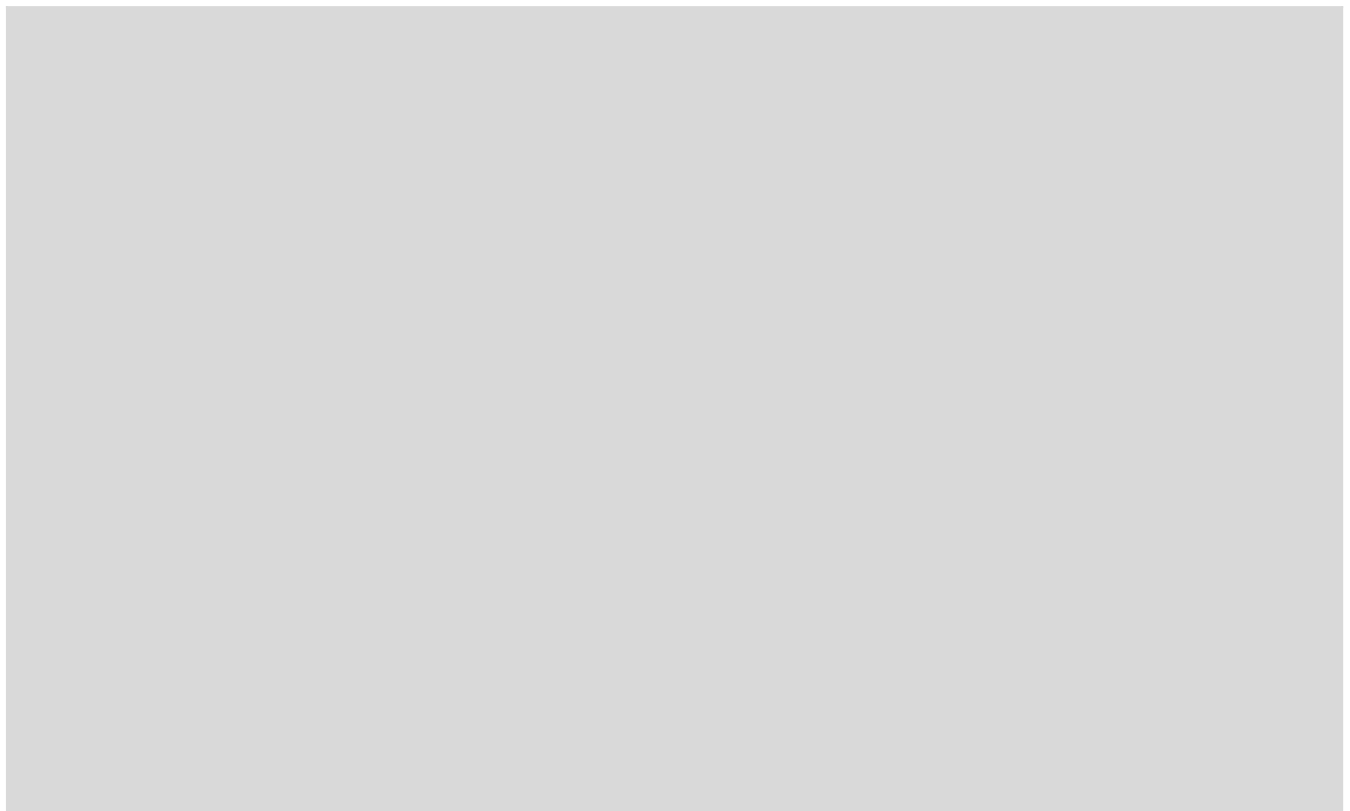
Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining Issac Newton's Second Law of Motion.



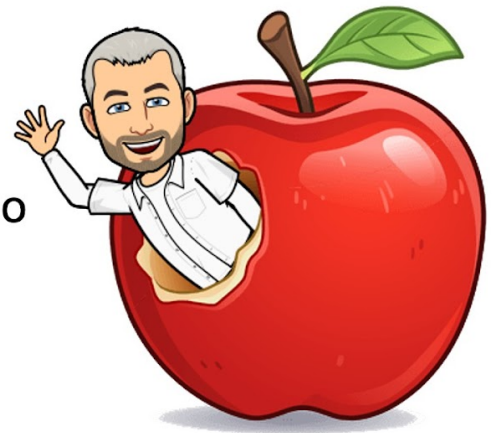
Name: _____

Date: _____



Applying Lab

Proving That We Can Do
It Ourselves



Directions: Answer each question below carefully.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To demonstrate your understanding of Newton's Second Law

Using Mathematics And Computational Thinking

Scientists use math to better understand and explain the things they observe in the natural world. Math is a very important part of science. In this lab you will be using the formula $F=ma$ to solve a variety of math problems.

$F=ma$ is an algebraic math equation and requires an understanding of algebra to solve. If you are confused about how to do this, it is okay to seek an adult's help in solving each problem.

Solve each of the following problems using Isaac Newton's Second Law of Motion.

$F=ma$ (f =force, m =mass, a =acceleration)

Show your work

If an object has a mass of 12 grams, and if it accelerates at a rate of 10 meters per second squared, how much force must have been applied to it?

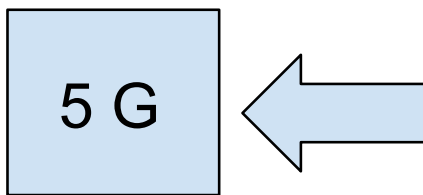
If an object has a mass of 6 g, and if it accelerates at a rate of 3 m/s^2 , how much force must have been applied to it?

If a force of 40 newtons is applied to an object that has a mass of 8 grams, how fast will that object accelerate?

If a force of 88 n is applied to an object that has a mass of 11 g, how fast will that object accelerate?

If a force of 24 newtons is applied to an object, and if that object then accelerates at a rate of 6 meters per second squared, then how much mass must the object have had?

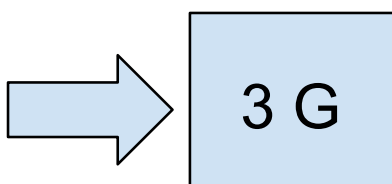
If a force of 16 n is applied to an object, and if that object then accelerates at a rate of 2 m/s^2 , then how much mass must the object have had?



5 m/s^2

Which direction will this object go? Hint: The arrow shows the direction it is being pushed.

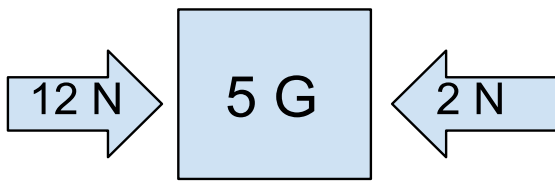
Calculate the force that was used to push this object. Notice that it is accelerating at a rate of 5 m/s^2 and it has a mass of 5 grams.



10 m/s^2

Which direction will the object go?

Calculate the force that was used to push this object. Notice that it is accelerating at a rate of 10 m/s^2 and it has a mass of 3 grams.



Which direction will this object go?

Calculate how fast it will accelerate.

Hint: If I push on one side of a box with 12N of force, and someone else pushes back with 2N of force in the other direction, what will the total net force be?

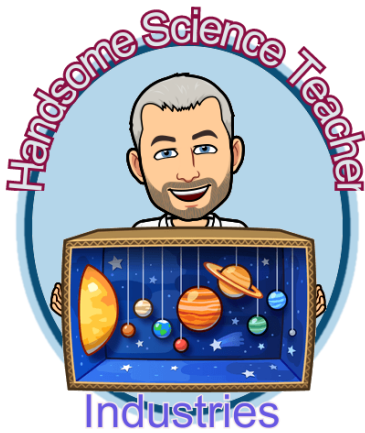
Final Questions:

Answer each question using complete sentences.

1. If we increase the mass of an object, how will that affect its acceleration? Explain your answer in detail, including why this is the case.

2. If we increase the force applied to an object how will this affect its acceleration? Explain your answer in detail, including why this is the case.

3. Draw a picture showing Newton's Second Law in action.



Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





Newton's Third Law of Motion - A STEM Lab

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about Newton's Third Law of Motion.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Issac Newton
- The Laws of Motion
- The Third Law of Motion
- What happens when you push against another object?
- How does this reaction occur on Earth?
- How does this reaction occur in space?

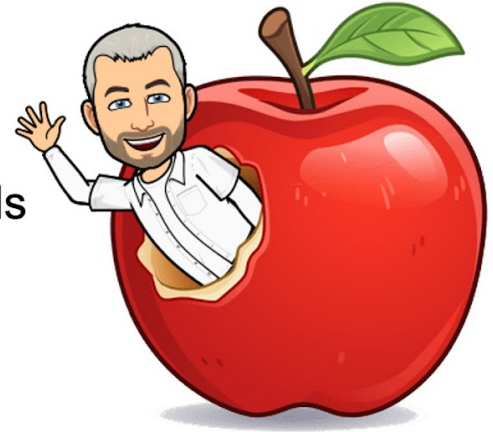
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Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering Newton's Third Law of Motion

Directions: Follow the directions below to learn about Newton's Third Law of Motion



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about Newton's Third Law

Humpty Dumpty drove in his car. Humpty Dumpty didn't get far... because he crashed into a wall! But I mean, who gave an egg a driver's license anyway! That seems like an oversight on the part of the DMV.

Your job is to build Humpty Dumpty protective gear that can keep him from breaking the next time he crashes. (Because he is a really bad driver!)

Supplies For This Lab

For this lab, you will need an egg, a small car, and anything else you want to use to protect your egg from breaking. Note that an inexpensive option for a car is a pinewood derby kit. Which you can get at most local BSA stores. Home Depot also often sells really good wooden car kits for little money.

Build A Basic Car

For this lab, you will need a vehicle for Humpty Dumpty to ride on. Have fun making the car, but don't spend too much time on it. Your car does not need to be overly complicated. Just a place for your egg to rest, and four wheels.

Decorate Humpty Dumpty

Once again, have fun with this, but don't spend too much time on it. Also, don't get attached... because he may die.

Plan Your Design

Engineers are a special kind of scientist that create ideas and inventions to solve problems. When solving a new problem they always start by first planning. They often use computer programs for this, such as Autocad. Before computers, though they did this planning using paper and pencil, which is what we will be doing.

Later in this lab, you will be crashing your car and its passenger into a wall. How can you protect the egg from breaking? You are allowed to use anything you want. From seatbelts to padding.

Diagram and protective measures in the space provided.



Put Your Design Into Action

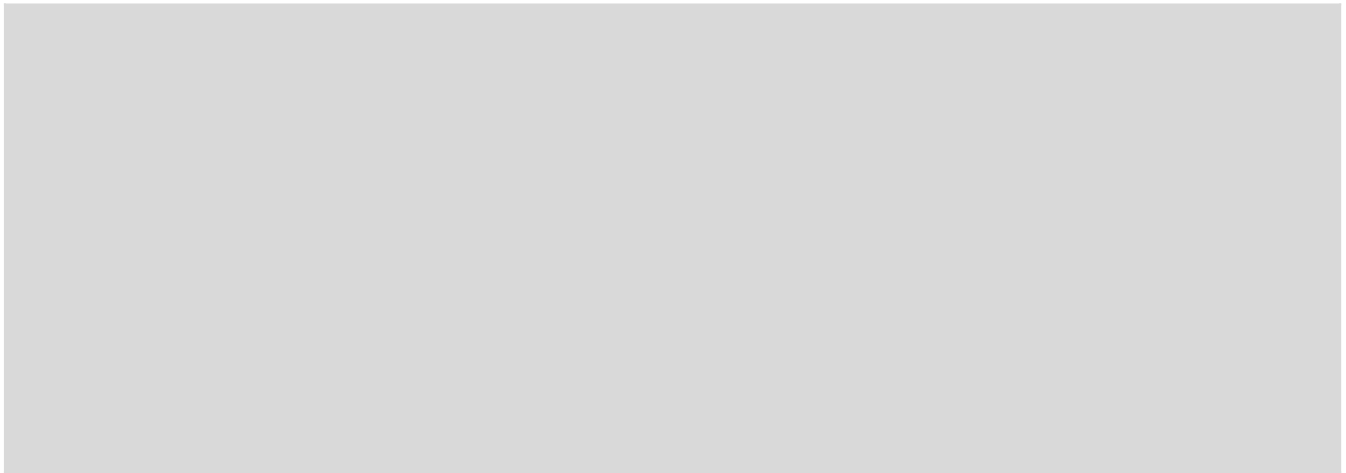
Now that your design is completed, it's time to build it. Place your egg inside a sandwich baggie (to protect your home from the mess) and then set your egg onto your car. Use the protective measures you invented to help protect your egg.

Test Your Design

Build a ramp with the end of the ramp being no more than a few feet away from a wall. You want your ramp to be at least five feet high. A good way to build a ramp is to use a staircase and cardboard. You can also use a folding table, or just hold a board in the air.

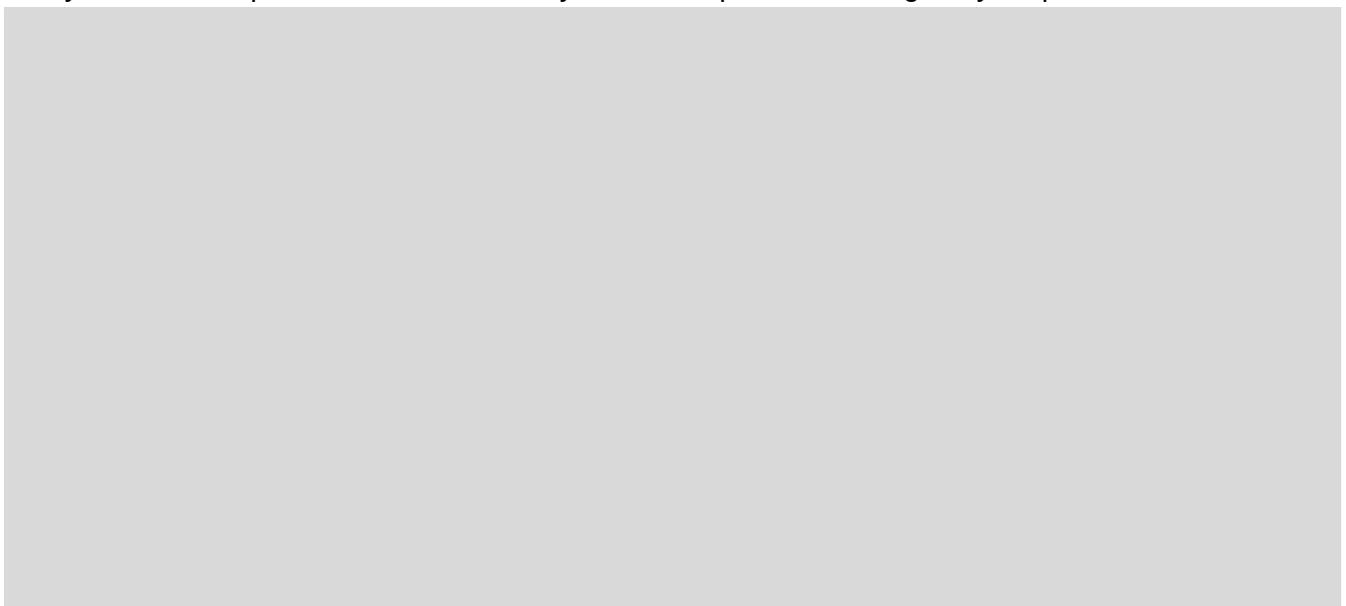
Once your ramp and car are ready put your car at the top of the ramp, and let it go down until it crashes into the wall.

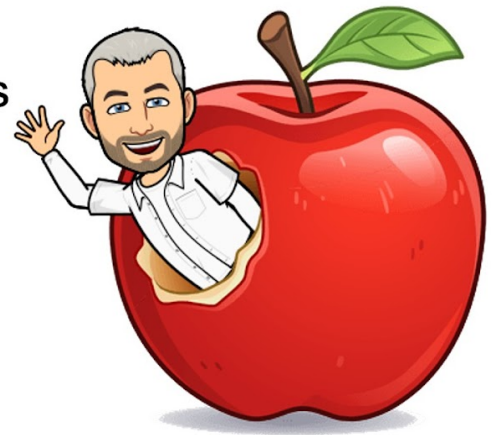
Record your results below. Explain what happened in detail.



The Engineering Process

Engineers are always improving their designs. No matter how good an idea or technology is, there is always room for improvement. What could you do to improve the design of your protective devices?





Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

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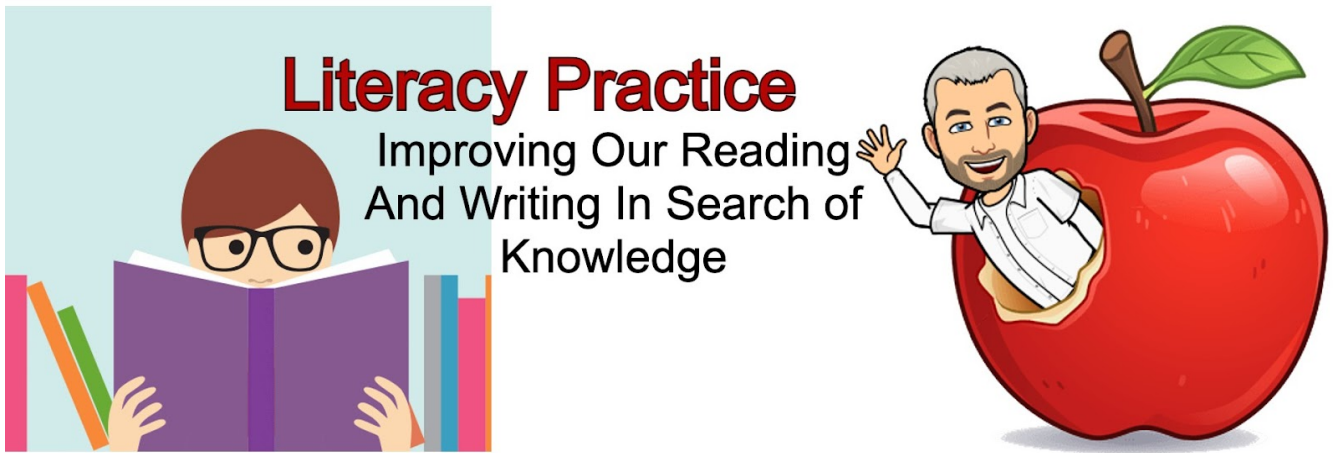
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- 10.

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Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Lunar Phases

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

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1. Practice Reading For Understanding

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2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



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Quiz Time

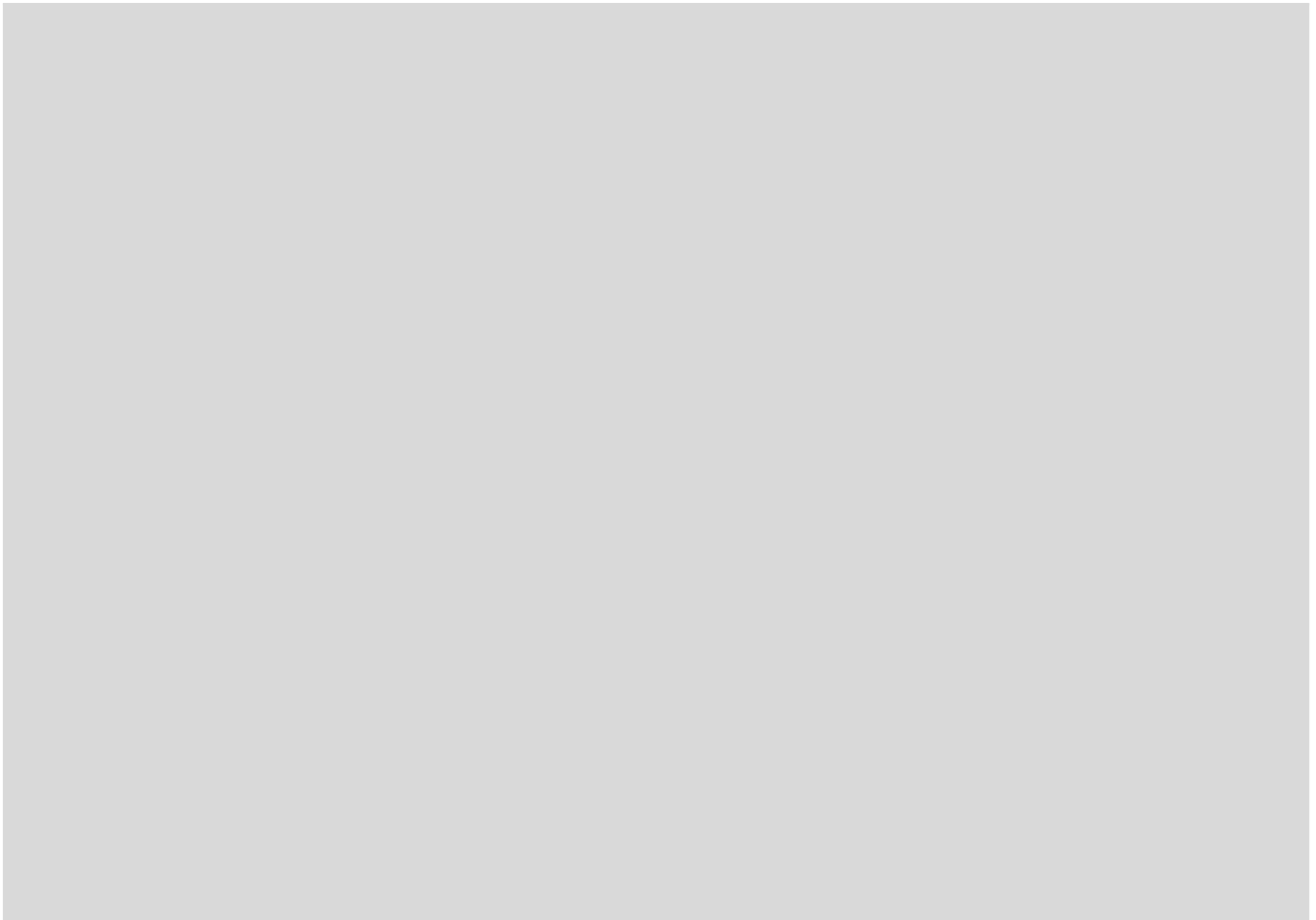
Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining Issac Newton's Third Law of Motion.



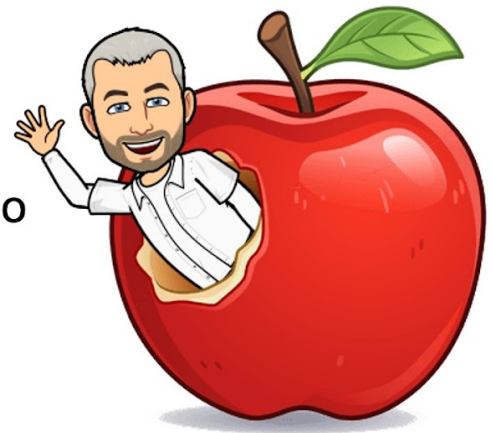
Name: _____

Date: _____



Applying Lab

Proving That We Can Do It Ourselves



Directions: Follow the steps outlined below to create an improved car design.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To use the engineering process in order to create an improved car

That incorrigible Humpty Dumpty has just been released from the hospital and is eager to go on his next drive down the ramp you built for him! If he didn't break in your first trial, great work! But, we can still do better.

Supplies For This Lab

For this lab, you will need an egg, a small car, and anything else you want to use to protect your egg from breaking. Note that an inexpensive option for a car is a pinewood derby kit. Which you can get at most local BSA stores. Home Depot also often sells really good wooden car kits for little money.

What Can You Do To Improve Your Design?

If your egg broke on the first trial, then your goal is to improve your design so that your egg does not break this time. If your egg survived on the first trial then your goal is to increase the force of the crash so that it is more violent. (Do not damage your wall!)

Plan Your Design

Engineers are a special kind of scientist that create ideas and inventions to solve problems. When solving a new problem they always start by first planning. They often use computer programs for this, such as Autocad. Before computers, though they did this planning using paper and pencil, which is what we will be doing.

Later in this lab, you will be crashing your car and its passenger into a wall. How can you protect the egg from breaking? You are allowed to use anything you want. From seatbelts to padding.

Diagram and protective measures in the space provided.



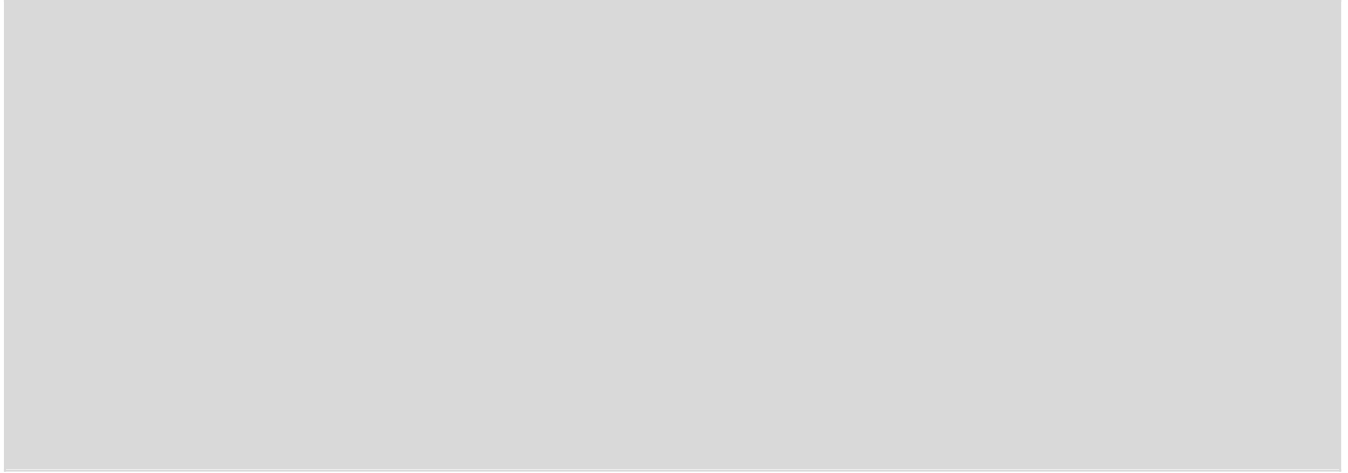
Put Your Design Into Action

Now that your design is completed, it's time to build it. Place your egg inside a sandwich baggie (to protect your home from the mess) and then set your egg onto your car. Use the protective measures you invented to help protect your egg.

Test Your Design

Once your ramp and car are ready put your car at the top of the ramp, and let it go down until it crashes into the wall.

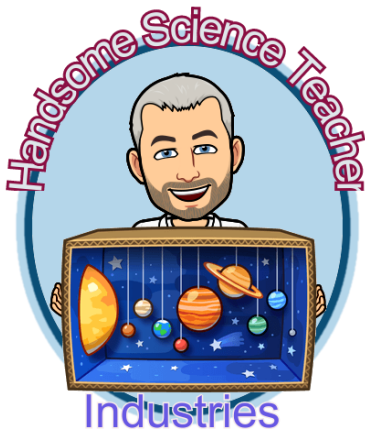
Record your results below. Explain what happened in detail. Was your design more effective this time?



The Engineering Process

Engineers are always improving their designs. No matter how good an idea or technology is, there is always room for improvement. What could you do to improve the design of your protective devices?





Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

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[Large gray rectangular area for student self-evaluation]

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[Large gray rectangular area for counselor evaluation]

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

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The Law of Gravity

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about The Law of Gravity

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Issac Newton
- The Law of Gravity
- What is gravity?
- How does gravity affect objects?
- What causes gravity?
- How does distance affect gravity?

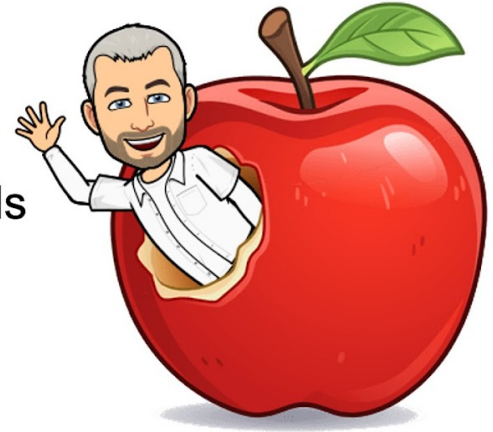
Name: _____

Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering Gravity

Directions: Follow the directions below to learn about gravity.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about gravity

Using Computer Simulations

In science sometimes it is very difficult or even impossible to study phenomena directly. This might be because the phenomenon is too large such as a planet. It might be because it is too complex, such as the weather. Or, it might be because it spans too much time, such as plate tectonics.

Scientists use computer simulations to help them understand these complex problems. Using a computer they can track many complex factors, adjust the scale, and alter the time so that they can obtain results more quickly.

Studying Gravity With Computer Simulations


Gravity is an example of a phenomenon that is difficult to study. However, we can use computer simulations to try and understand it better.

For this lab, you will need to go online and find a simulation of gravity. There are many good simulations available. We cannot suggest one, because the links change too quickly and this book would become outdated. However, you can find one by using a search engine.

Spend a minimum of 30 minutes using the simulation. Then return and answer the questions on the next page.

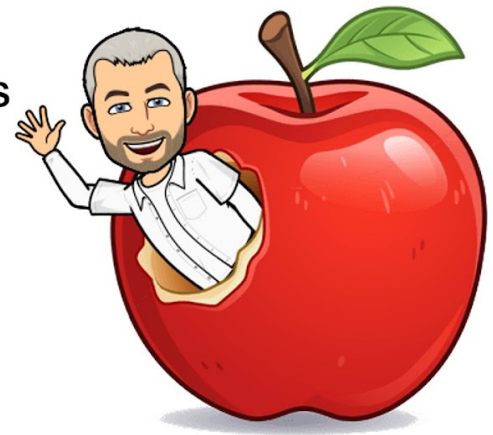
Note: It is a good idea to use more than one simulation. This will help you see how gravity is presented differently by different simulations.

What did you learn about gravity from the simulation you completed? Be detailed.



Based on what you learned, draw a picture of two objects in space. Label your diagram showing how the gravity of the objects affects each other.





Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

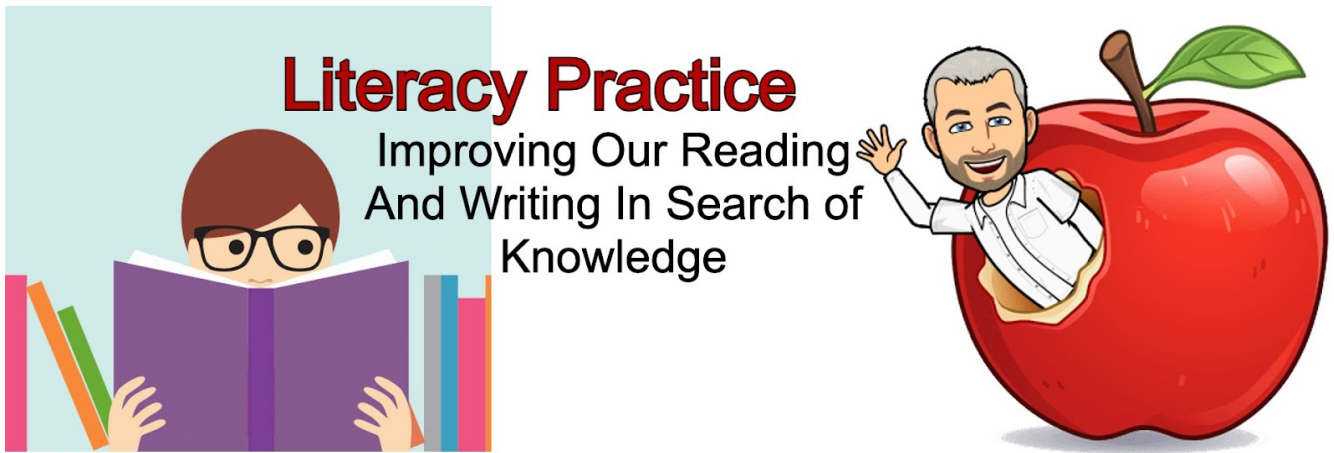
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
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- 6.
- 7.
- 8.
- 9.
- 10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Lunar Phases

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/the-law-of-gravity/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

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I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining what gravity is and how it affects objects in the Universe.

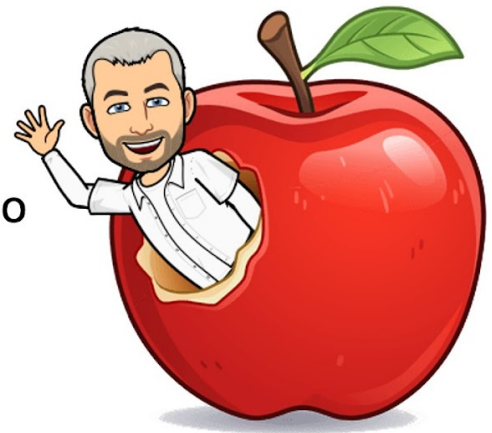
Name: _____

Date: _____



Applying Lab

Proving That We Can Do It Ourselves



Directions: Follow the steps outlined below to create a diagram showing how gravity bends the fabric of spacetime.



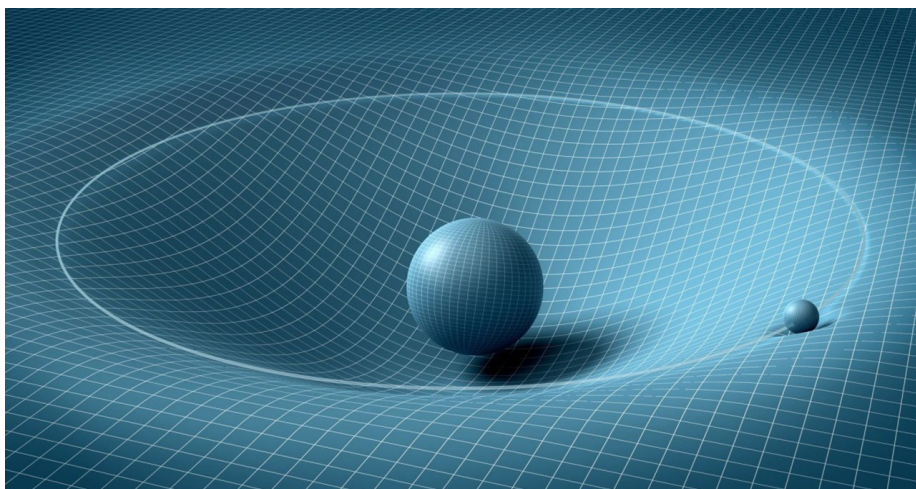
Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

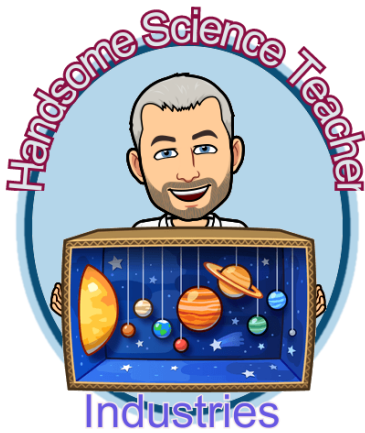
Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To demonstrate your understanding of what gravity is, and how it affects spacetime.

In the video, we learned that gravity works by creating a distortion or bend in the fabric of spacetime. Create a detailed diagram showing how this occurs. Make sure to include all of the following in your diagram:

- Diagram must be in color.
- Include at least three objects of various sizes and gravity.
- Show the relationship between mass and the size of the distortion in spacetime.
- Show how objects become trapped by the distortion created in spacetime.
- Show how objects that are moving fast enough can escape from this distortion.
- Label your diagram.





Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





Fields, Electricity, Magnetism

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will analyze and interpret data about what fields are and how they work. To do this we will investigate two very common types of fields, including static electricity and magnetism.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What are fields?
- How does static electricity work?
 - Positive And Negative
- How does magnetism work?
 - North And South
- Opposites Attract
- Likes Repel

Name: _____

Date: _____



Discovering Lab

Learning Through Hands On Activities



Activity: Discovering The What Fields Are And How They Work

Directions: Follow the steps below to collect data about fields. Make sure you record all of your answers using complete sentences.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about fields

Trial # 1: Balloons & Hair

Instructions: Collecting and graphing data about the impact of static electricity on your hair. Rub a balloon against your hair one time, then hold the balloon about six inches above your head and observe in a mirror how many of your hairs stand up. Graph the number of hairs that stand up towards the balloon by coloring in the chart below. Repeat but this time rub the balloon against your hair 2 times, then 3 times, etc. Each time graph how many hairs stand on end. Note: It is okay to estimate. You don't have to count each hair! Also, note that some types of hair are not ideal for this lab. It is okay to use a doll as a substitute if needed.

Complete this graph by filling/shading in the boxes

500+ Hairs Standing								
300 Hairs Standing								
100 Hairs Standing								
50 Hairs Standing								
10 Hairs Standing								
	1 Rub	2 Rubs	3 Rubs	4 Rubs	5 Rubs	6 Rubs	7 Rubs	8 Rubs

- Analyze your data.** What conclusions can you draw about how rubbing the balloon against someone's hair affects the static electricity found in the balloon and in the person's hair?

- How does distance affect the strength of static electricity? In other words, if you move the balloon further away from your head, what happens? What happens if you move the balloon closer to your head?

- Why is your hair attracted to the balloon? Explain what is happening.

- Notice that each strand of your hair appears to separate or to repel one another. Each hair going in a different direction. Explain why you think this is occurring.

5.

Trial # 2: Can Racing

Instructions: Rub a small balloon (not fully inflated) against your hair 40 times. Then use the balloon to pull an empty soda can across a table. Use a ruler to measure the maximum distance from the can that you can place the balloon while still attracting it. Graph your results below. Then repeat with a medium-sized balloon and a large-sized balloon.

Complete this graph by filling/shading in the boxes

Distance of 24 cm			
Distance of 21 cm			
Distance of 18 cm			
Distance of 15 cm			
Distance of 12 cm			
Distance of 9 cm			
Distance of 6 cm			
Distance of 3 cm			
	Small Balloon	Medium Balloon	Large Balloon

1. **Analyze your data.** What conclusions can you draw about how the size of a balloon affects the strength of static electricity.

2. How does distance affect the strength of static electricity? If you move a balloon further from a can what happens to its ability to attract the can?

3. What is static electricity? Explain how static electricity can attract and repel objects.

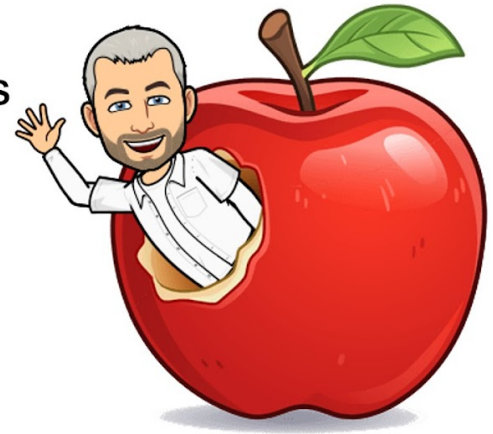
4. What are the two opposing (opposite) charges that exist within static electricity? Explain how these two charges react to each other.

5. What is an electron? What charge does it have?



Video Instruction

Reviewing The Teacher's
Instruction At My Own
Pace



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

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Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

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Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

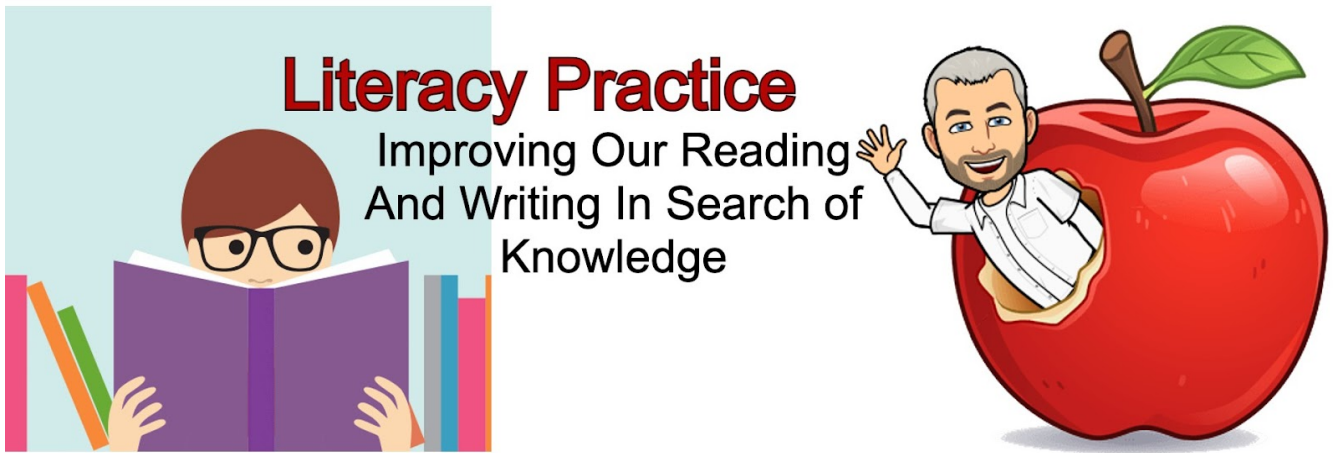
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- 1.
- 2.
- 3.
- 4.
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- 6.
- 7.
- 8.
- 9.
- 10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Biomes

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/why-do-magnets-attract-and-repel/>

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Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining what magnetism is, and how it works.

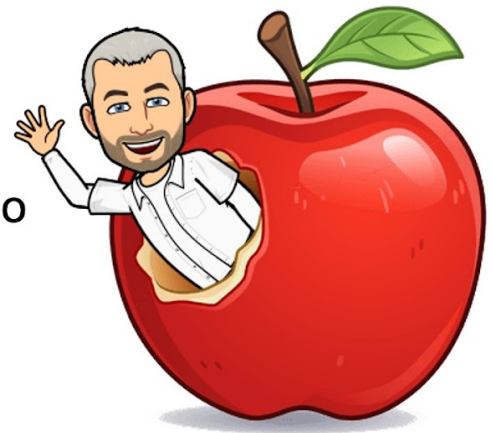
Name: _____

Date: _____



Applying Lab

Proving That We Can Do It Ourselves



Activity: Applying Fields Using Magnetism

Directions: You are going to collect data about the strength of various magnets and how this impacts the objects it can attract. You are then going to analyze your data to draw appropriate conclusions.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To collect and analyze data about magnetism.

Trial # 1: Three Magnets

Instructions: Using three different magnets and several metal objects such as washers, paper clips, pins, and so forth, observe how many objects each magnet can hold. Graph your data below. T

Complete this graph by filling/shading in the boxes

More than 50 objects			
41 - 50 objects			
31 - 40 objects			
21 - 30 objects			
11 - 20 objects			
4 - 10 objects			
3 or less objects			
	Magnet # 1	Magnet # 2	Magnet # 3

Analyze your data.

1. What conclusions can you draw about how the strength of a magnet affects the objects it attracts?

1. How does the distance you hold a magnet away from the metal objects affect the strength of their attraction? If you move a magnet farther from metal what happens to its ability to attract objects?

2. What is a magnetic field? Explain how a magnetic field can attract or repel objects.

3. What are the two sides or poles of a magnet? Explain how these two sides react to each

Final Questions:

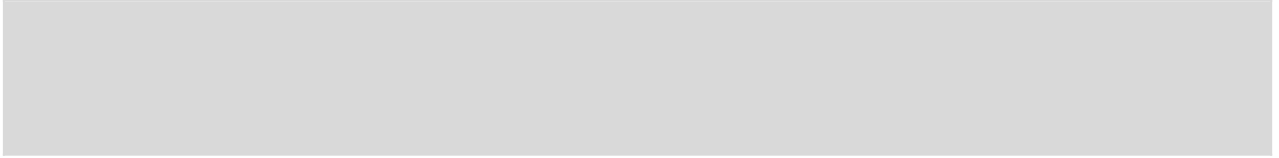
Answer each question using complete sentences.

1. What is a field?

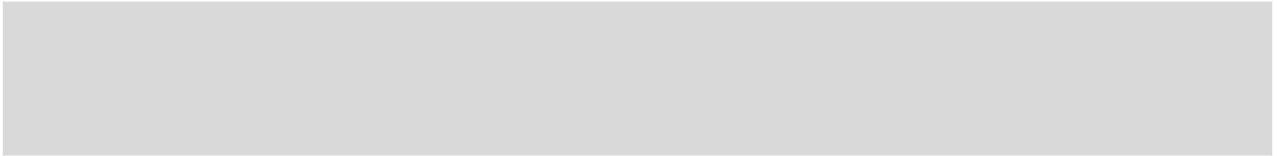
2. Name at least two types of fields.

3. What evidence could you use to convince someone that a balloon has static electricity?

4. What evidence could you use to convince someone that the Earth has a magnetic field? (this might require some thinking on your part! What can you think of that interacts with the Earth's magnetic field? You could use this type of object or tool to prove the Earth does have a magnetic field).



5. Why is it important for a scientist to collect data?



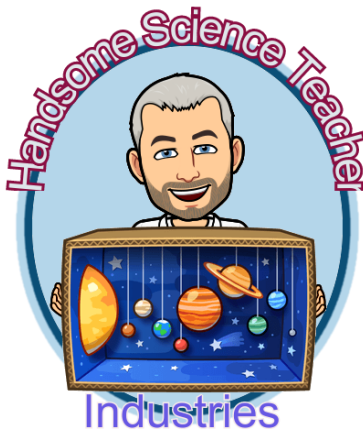
6. How can graphing data be helpful?



7. How can looking for patterns in the data be helpful?



- 8.



Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

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If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





The Properties of Light

What I Will Be Learning In This Mastery Badge:

In this mastery badge you will learn about one of the most prevalent and yet fascinating phenomena in the Universe. Which is light. Light is all around us, but what is it? Why does it move so fast? Why does it allow us to 'see' things? By the end of this Mastery Badge, you will be able to describe what light is, and how it interacts with other substances.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is light, Electromagnetic Spectrum
- Light moves in waves.
- Light is made up of photons
- Light has no mass. Which allows it to travel very fast.
- Absorption, Transmission, Reflection
- Transparent, Translucent, Opaque

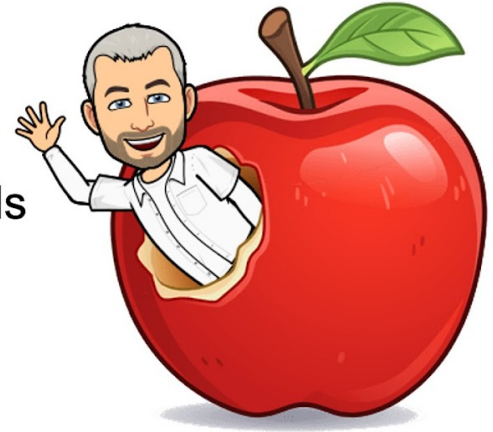
Name: _____

Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering How Light Interacts With The Environment

Directions: Follow the steps below to discover the properties of light.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about light

Experiment: Predicting How Light Will Interact With Objects In An Environment

Supplies

For this experiment, you will need a piece of clear glass such as a cup or window. A mirror, a book, your hand, and a flashlight.

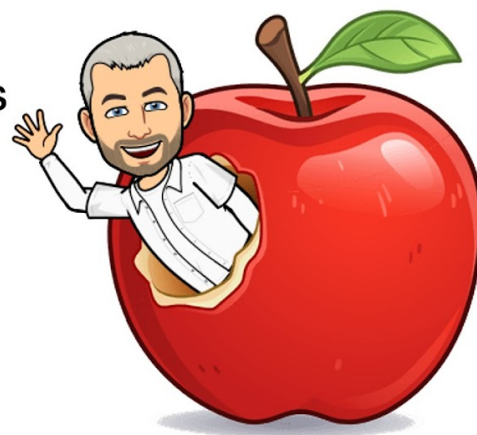
How Does Light Interact With Its Environment?

When light encounters different objects and substances it doesn't always behave in the same way. Sometimes it passes through an object, sometimes it bounces off an object, and other times it is simply absorbed. Complete the chart on the next page by first making a prediction about what you think will happen when light is applied to an object or substance. Then perform the experiment and record what actually happened.

Object	My Prediction	What actually happened
Clear Glass		
Mirror		
Book		
My Hand (In A Dark Room)		

Analyze your Results

What did you learn about how light interacts with objects and substances? There are no wrong answers. What is important is only that your answer can be supported by the results of your experimentation. Write a detailed explanation of what light does when it encounters different types of objects. Support your answer with your experiment results.



Handsome Science Teacher One Take Videos

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Take Your Time, Pause And Rewind As needed

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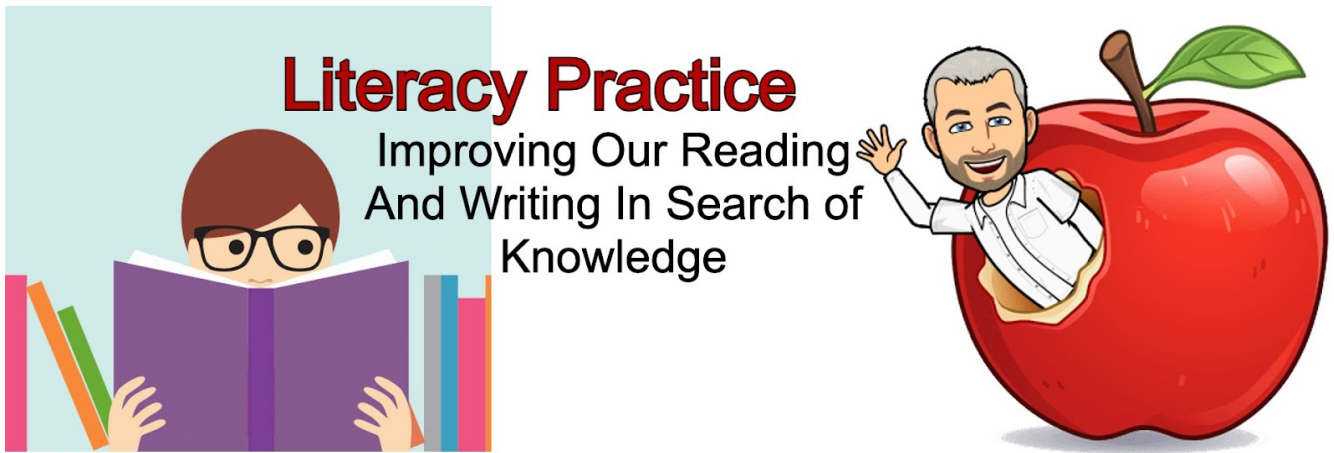
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Now, Let's Connect These New Concepts To Things You Already Knew

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Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Biomes

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Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/what-is-light/>

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Quiz Time

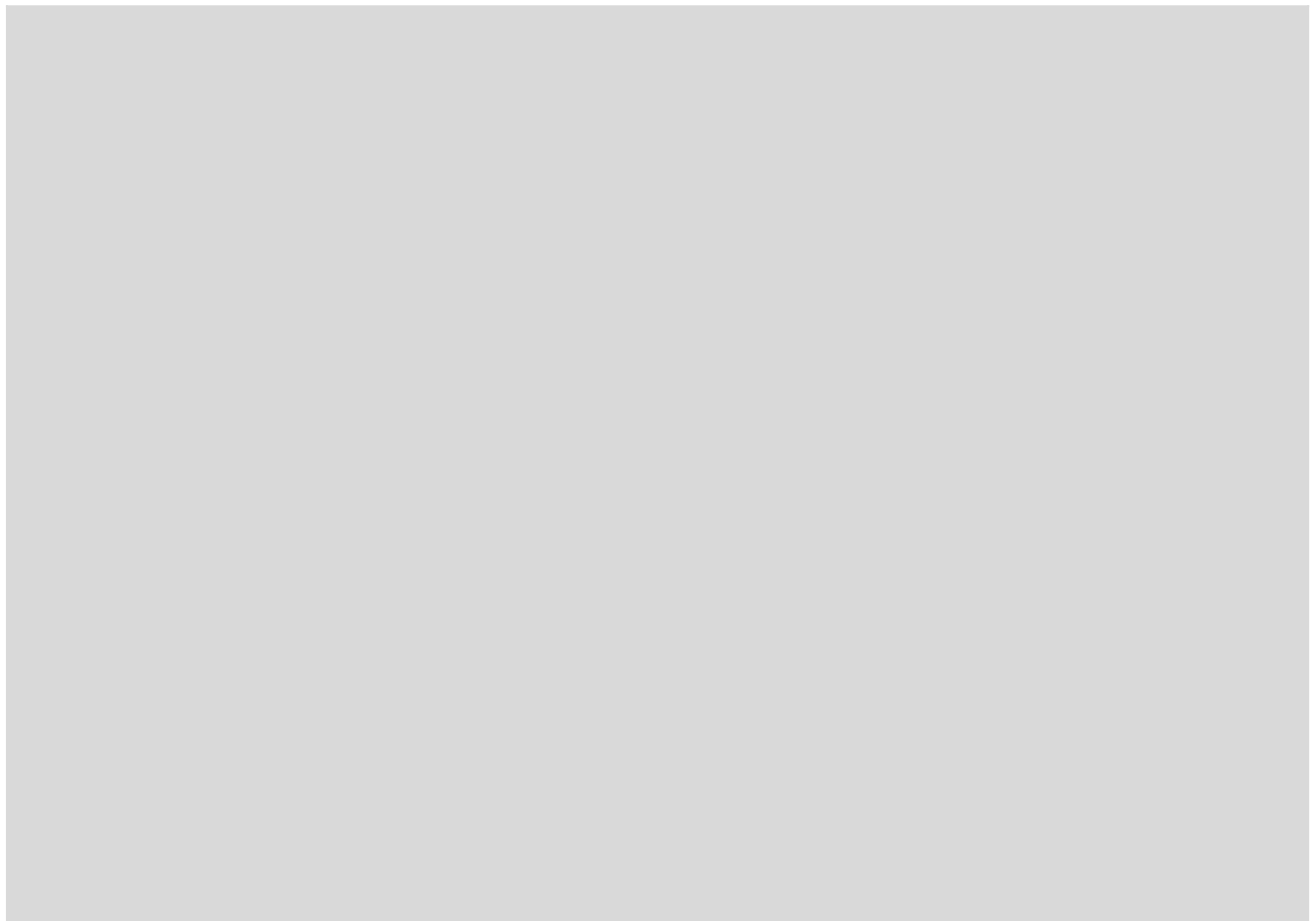
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%

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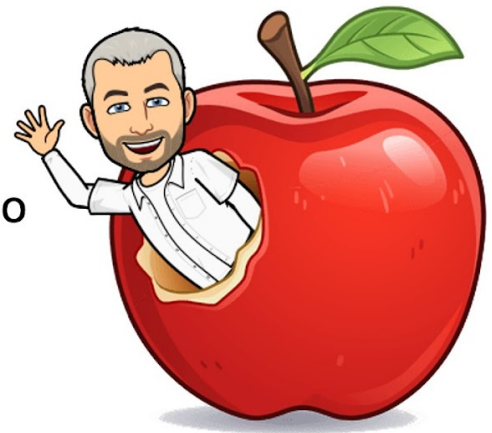
Name: _____

Date: _____



Applying Lab

Proving That We Can Do
It Ourselves



Activity: Applying The Properties of Light By Making Your Own Experiment

Directions: Scientists do far more than just carry out the experiments of others. They also create their own experiments. Which can be very challenging. In this lab you will be designing your own experiment.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To create your own experiment using light.

Asking A Question:

Creating your own experiment is both challenging and fun. All experiments begin with a question. Write a question that you would like to explore further.

Examples: What will happen to light if I pass it through different types of liquids?
 How do humans perceive and react to different colors of lighting?
 Can the color of light be altered by passing it through a substance?

This is your question and your experiment. You are the scientist. You can explore any aspect of lighting that you want.

The Question I Will Explore:

Why I Selected This Question:

Planning Your Experiment:

Once you have selected a question, you need to design your experiment. Write detailed steps, explaining how to carry out your experiment. These should be written so that someone else can follow them. Don't skip any steps. Mention everything that the scientist is supposed to do from beginning to end.

Step By Step Procedures:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Carry Out Your Experiment:

Once you have planned your experiment the next step is to carry it out, and to record your observations. Briefly describe what happened when you carried out the experiment you created above.

I observed the following things from my experiment:

- 1.
- 2.
- 3.
- 4.
- 5.

Communicate Your Discovery To Others:

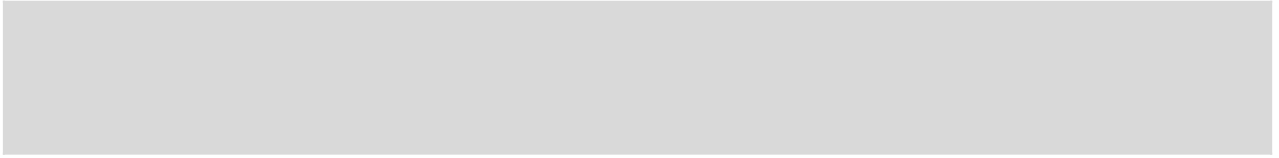
When scientists make discoveries they must communicate these discoveries to other people. Write a brief two-paragraph summary outlining your experiment and what you learned. Pretend that you are writing an article for a science journal (magazine). Be detailed as you explain to other scientists what you did, and what you learned from your research.



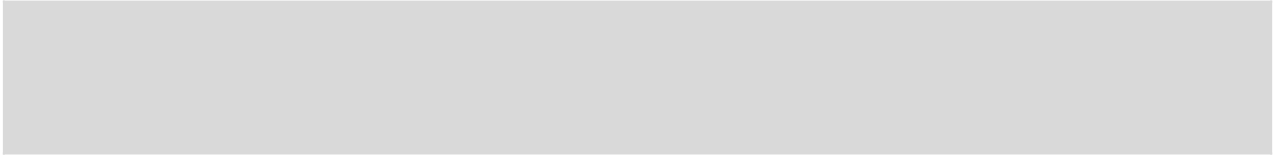
Final Questions:

Remember to use complete sentences.

1. What is light made of?

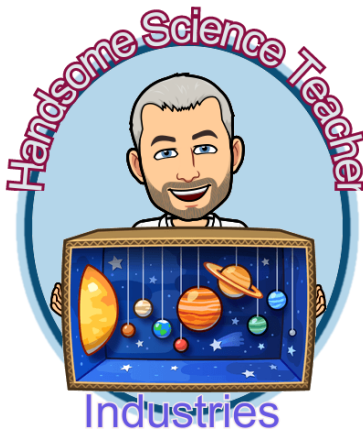


2. How fast does light travel?



3. What are the three things that light does when it interacts with objects? Be detailed and specific. Give examples of each type of interaction.





Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





The Layers of The Earth

What I Will Be Learning In This Mastery Badge:

In this mastery badge you will learn about the layers of the Earth, the names of each layer, and how these layers have sorted themselves naturally by their density.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Review density
- The layers of the Earth are sorted by density.
 - Inner Core
 - Outer Core
 - Mantle
 - Crust
 - Oceans
 - Atmosphere
- The characteristics of each layer

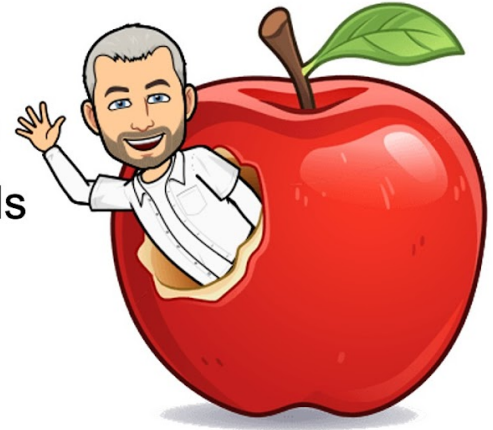
Name: _____

Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering The Layers of The Earth

Directions: For this lab, you are going to write a short story. You will first need to gather information and do research.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about each of the layers of the Earth.

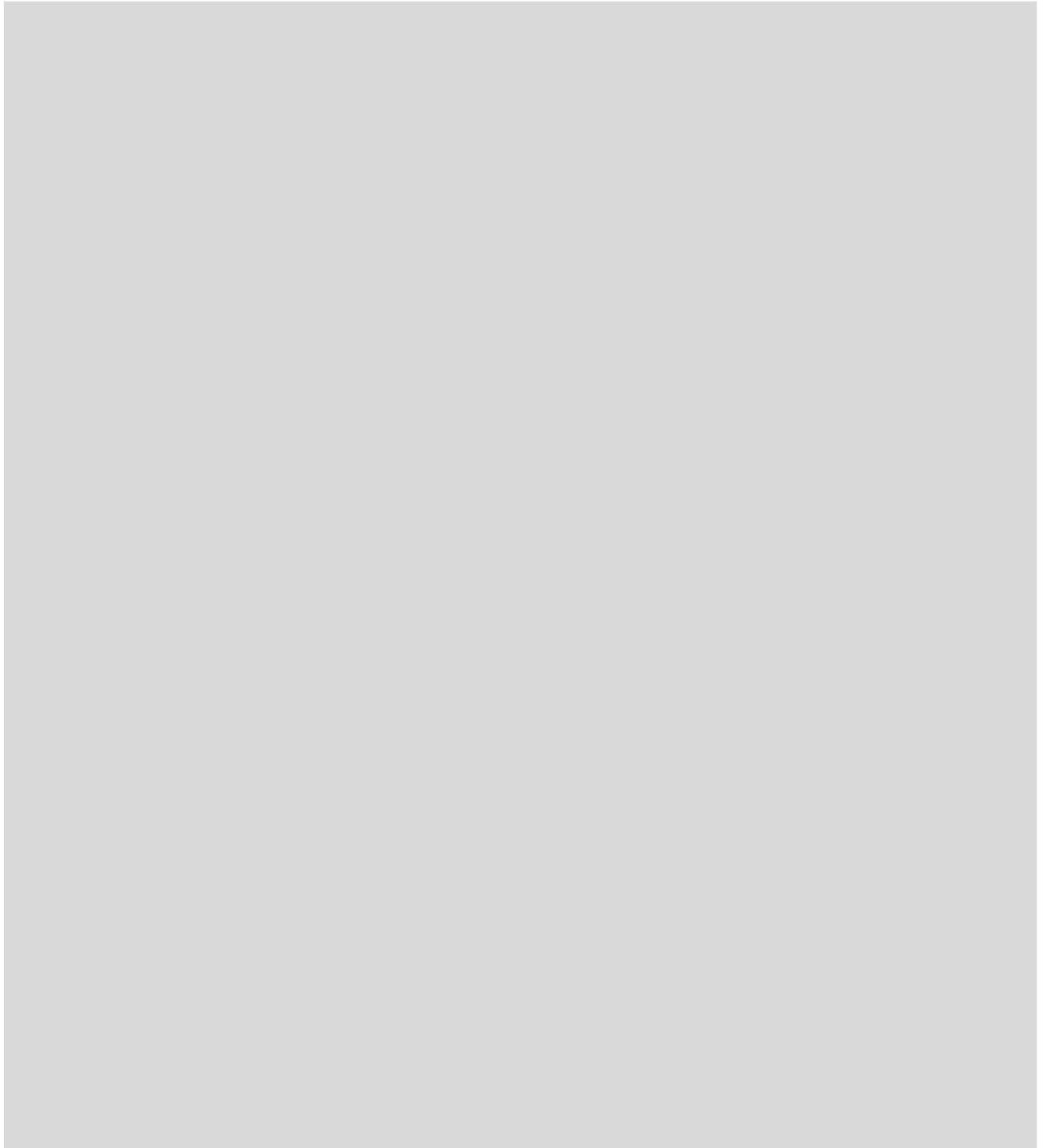
Research online, in books, or use other resources available to you to fill out this data table.

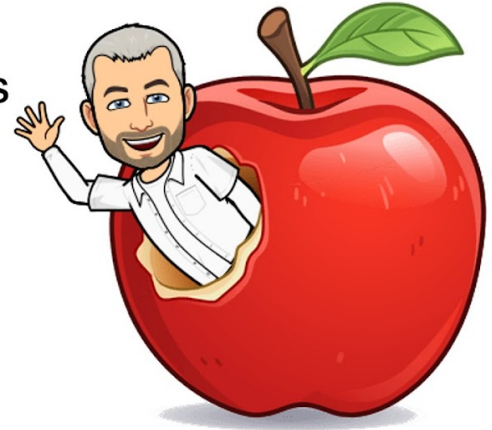
Layer of the Earth	What is this layer like? Where is it located? How Can I Remember it?
Inner Core	
Outer Core	
Mantle	
Crust	
Ocean	
Atmosphere	

Journey to the Center of the Earth Short Story

Now that you have completed your research, let's turn it into a story! Write a short story describing a hypothetical (but accurate) journey to the center of the Earth. The layers of the Earth must be accurate, but you can create fictional characters that do the traveling.

My Story





Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

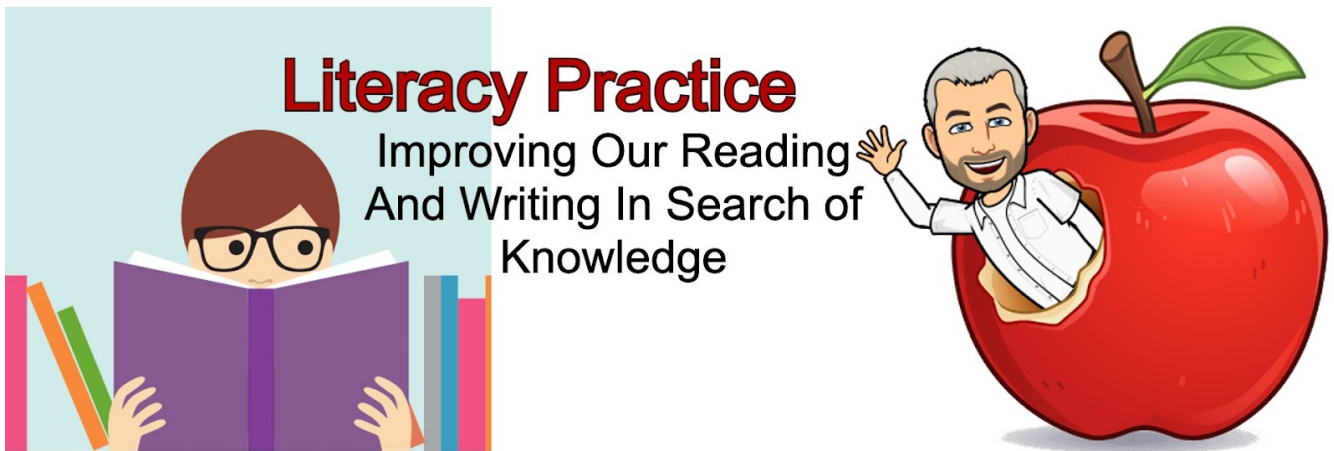
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.
2. **Practice Writing To Communicate**
Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/the-layers-of-the-earth/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time


Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words describing the layers of the Earth.



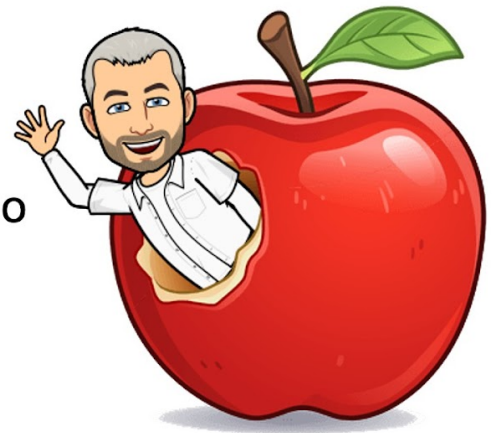
Name: _____

Date: _____



Applying Lab

Proving That We Can Do It Ourselves



Activity: Applying The Layers of The Earth To Solve A Problem

Directions: Follow the instructions below to create a model of the layers of the Earth.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To demonstrate your understanding of the layers of the Earth.

Scenario:

An angry army of aliens plan to attack the Earth and steal its molten core in order to power their spacecrafts. Stealing the core will destroy the Earth and all life on it.

Unfortunately the annoying humans are fighting back, and creating problems for these hard working aliens. The aliens need to work quickly so that they can finish destroying the Earth before the humans defeat them. To increase their speed and finish the destruction of the Earth more rapidly the Aliens need a detailed map of the layers of the Earth.

Your team has been hired by the aliens to develop a model of the Earth's interior that they can then use to destroy it. In exchange for your valiant service to the aliens they have promised to reward you with your very own tropical island... on the planet that you just helped destroy... Hooray!

Problem:

Design a model of the Earth's interior using the supplies that you find around your home. Your model must be accurate!

Possible Supplies That You Might Use:

Paper, glue, scissors, Clay, Play Dough, Foam Ball, or any other random stuff

Brainstorm (3-5 Minutes):

Spend a few minutes brainstorming how you will use your supplies to solve the problem. Write a detailed description of what supplies you will use, and how you will use them.

Describe the supplies you intend to use to create your model and how you will use them.

Model Must Include:

The model you build must include all of the following:

- Model is the correct scale
- All layers are shown
 - Inner Core, Outer Core, Mantle, Crust, Oceans, Atmosphere
- All layers are labeled
- You have at least three facts about each layer written down somewhere. These facts might include the following:
 - Materials in each layer
 - Temperature of each layer
 - Density of each layer
 - State of matter of each layer (Solid, Liquid, Gas)

Final Questions:

Answer each of the following questions using complete sentences.

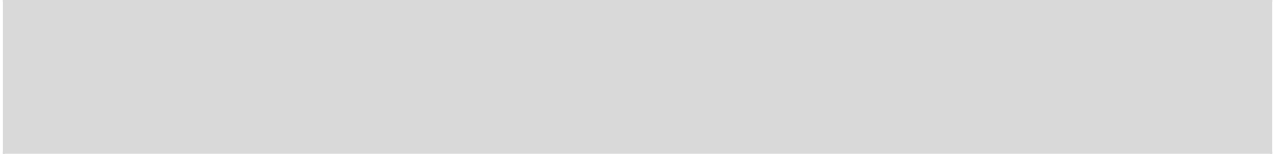
1. Which layers of the Earth are solid?

2. Which layers of the Earth are liquid?

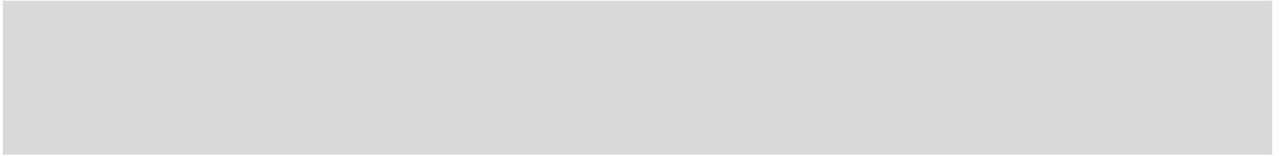
3. Which layers of the Earth are squishy?

4. Which layers of the Earth are gassy?

5. Which layer of the Earth is the densest?



6. Which layer of the Earth is the least dense?



7. What materials are found in each layer?

Inner Core:

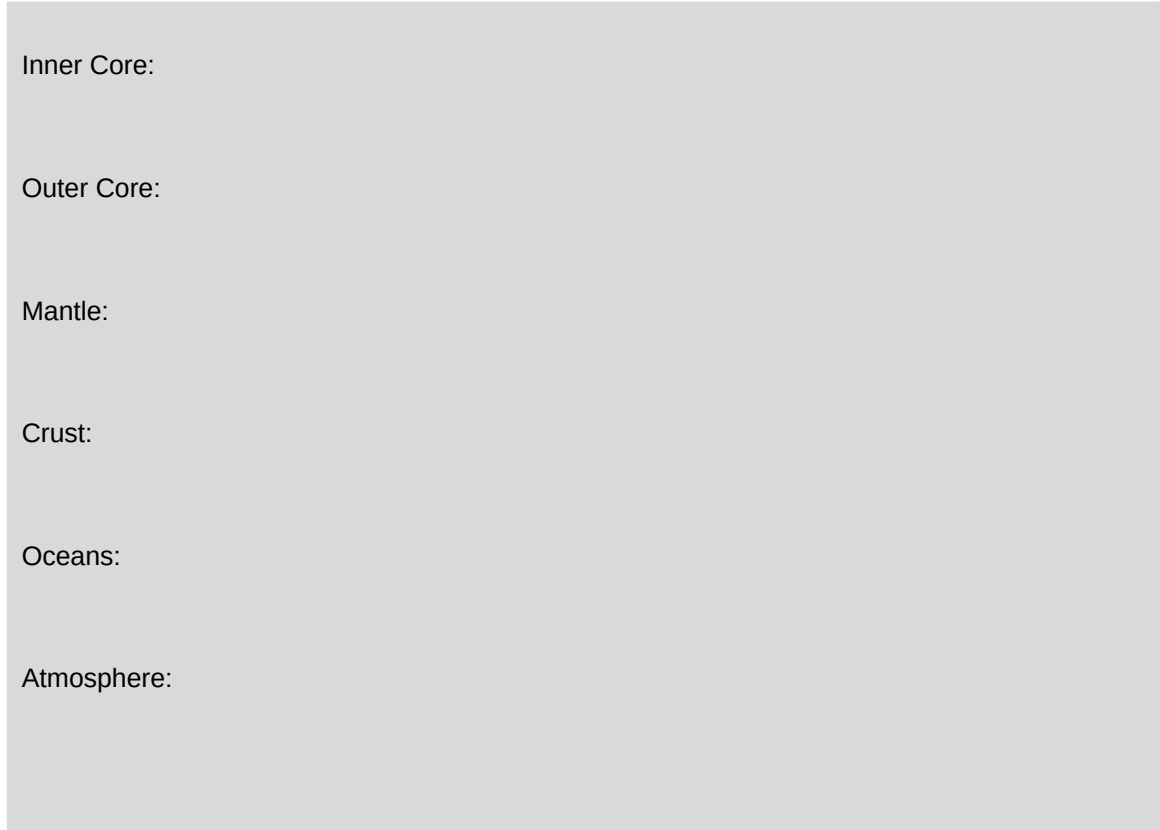
Outer Core:

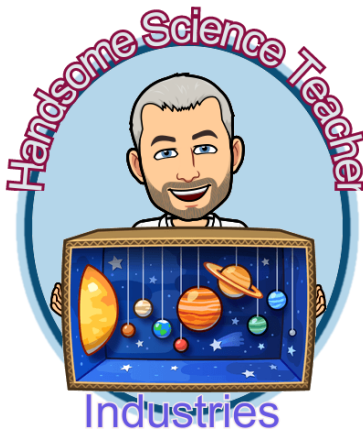
Mantle:

Crust:

Oceans:

Atmosphere:





Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
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Date

Signature of Mastery
Badge Counselor

Date

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Erosion And Weathering

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about two of the most important geologic forces on Earth. Which are erosion and weathering. You will learn the difference between these two forces, as well as how they work together to carve through and shape the surface of the Earth.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

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A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is weathering?
- Types of weathering.
 - Mass Wasting
 - Frost Wedging
 - Biological
 - Chemical
- What Is Erosion
- Types of Erosion
- Deposition, sedimentation, lake succession

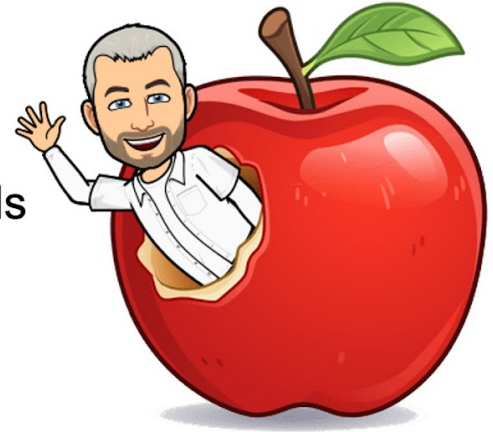
Name: _____

Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering How Erosion Changes the Surface of The Earth

Directions: Follow the steps below to discover how erosion alters the surface of the Earth



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

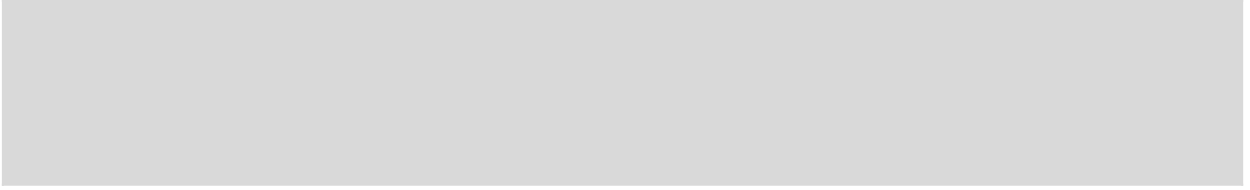
Goal: To learn as much as you can about erosion

Experiment Part I: Erosion In Action

Instructions: Fill a cake pan half full of sand or dirt. Using a cup or bottle, slowly pour water over the surface of the dirt. Observe what happens and record your results below.



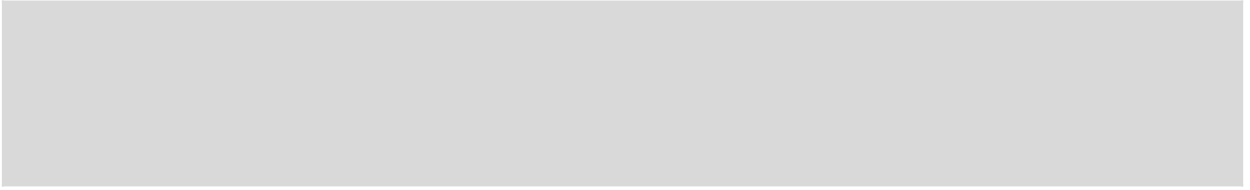
What do you observe? Be detailed and write using complete sentences.



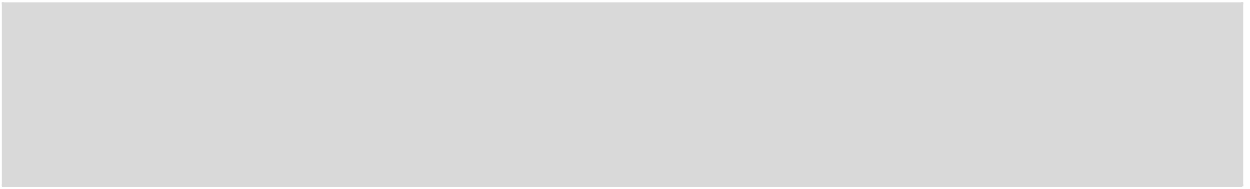
Experiment Part II: Erosion In My Neighborhood

Instructions: Look around your neighborhood or yard. Can you find any examples of where erosion is occurring? This might be near a drain, but could also be erosion caused by wind.

Diagram The Erosion You Observed:



Explain why you think the erosion you observed is happening. What is causing the ground to erode away where you live?



Final Questions:

Answer each question using complete sentences.

1. Explain what weathering is in your own words?



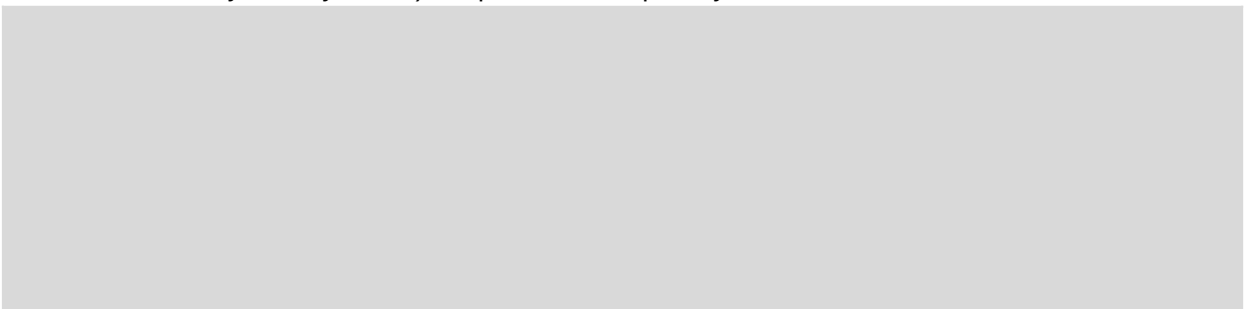
2. Explain what erosion is in your own words?



3. How do these two forces work together to alter the surface of the Earth?



4. Select an example of erosion away from your local area. Such as The Grand Canyon (you don't have to use the Grand Canyon but you can). Explain how the place you selected formed. Be detailed.





Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

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This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

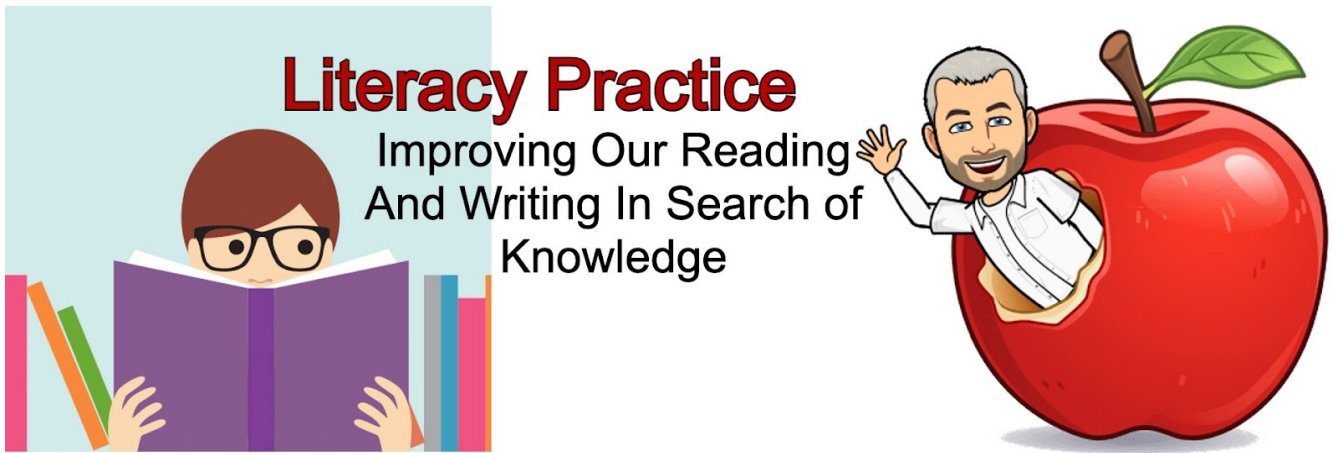
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- 1.
- 2.
- 3.
- 4.
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- 6.
- 7.
- 8.
- 9.
- 10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Biomes

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

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1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/mass-wasting-weathering-and-erosion/>

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Check Point

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I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining what weathering is. Share examples.

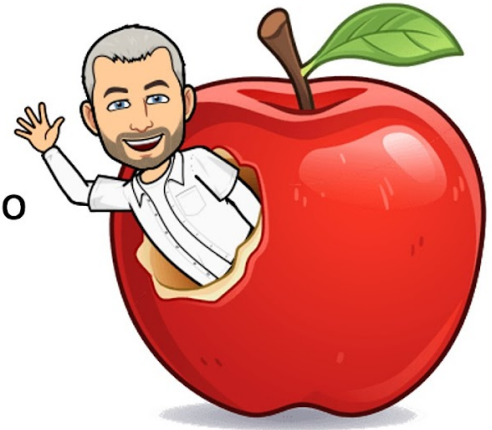
Name: _____

Date: _____



Applying Lab

Proving That We Can Do It Ourselves



Activity: Advocating For Change

Directions: Scientists often must educate the rest of society and advocate for changes that will help to preserve civilization, while maintaining a healthy environment. In this lab your job is to write an article warning an imaginary neighborhood that the homes in their community are threatened by a potential landslide. Imagine that the community members don't know what a landslide is, or how such an event could threaten them. Explain in detail to your audience how landslides occur, and how they sometimes destroy property. Then make a recommendation to the community on what they need to do to protect themselves. Support your recommendation with evidence.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To convince others that you are right

My Article:

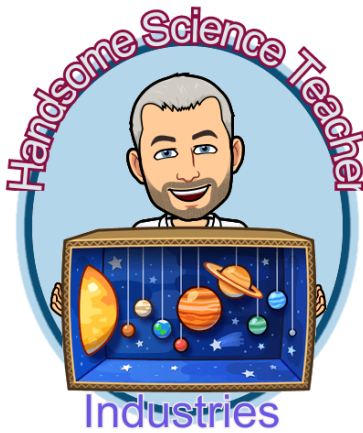
Your article should be a minimum of four paragraphs. Though longer is okay.

Final Questions:

1. What are some examples of weathering or erosion that occur quickly?

2. What are some examples of weathering or erosion that occur over a long period of time?

3. Compare the surface of the Earth to the surface of the Moon. Explain how erosion and weathering have impacted the Earth differently than the Moon.



Congratulations! You Have Completed The Entire Mastery Badge

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Time To Evaluate Your Work

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1. Did you do every assignment?
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Mastery Badge Counselor Evaluation:

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Student's Signature

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Signature of Mastery
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Date

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Plate Tectonics

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about the structure of the Earth's crust and how it is broken into plates. We will also look at boundaries between plates and how they interact with each other.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**

A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**

You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**

Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**

An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- The Crust of The Earth
- Plates
- Subduction Zones & Trenches
- Mid-Oceanic Rifts / Ridges

Name: _____

Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering Plate Tectonics

Directions: Follow the steps below to discover how rocks are alike and how they are different.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about plate tectonics.

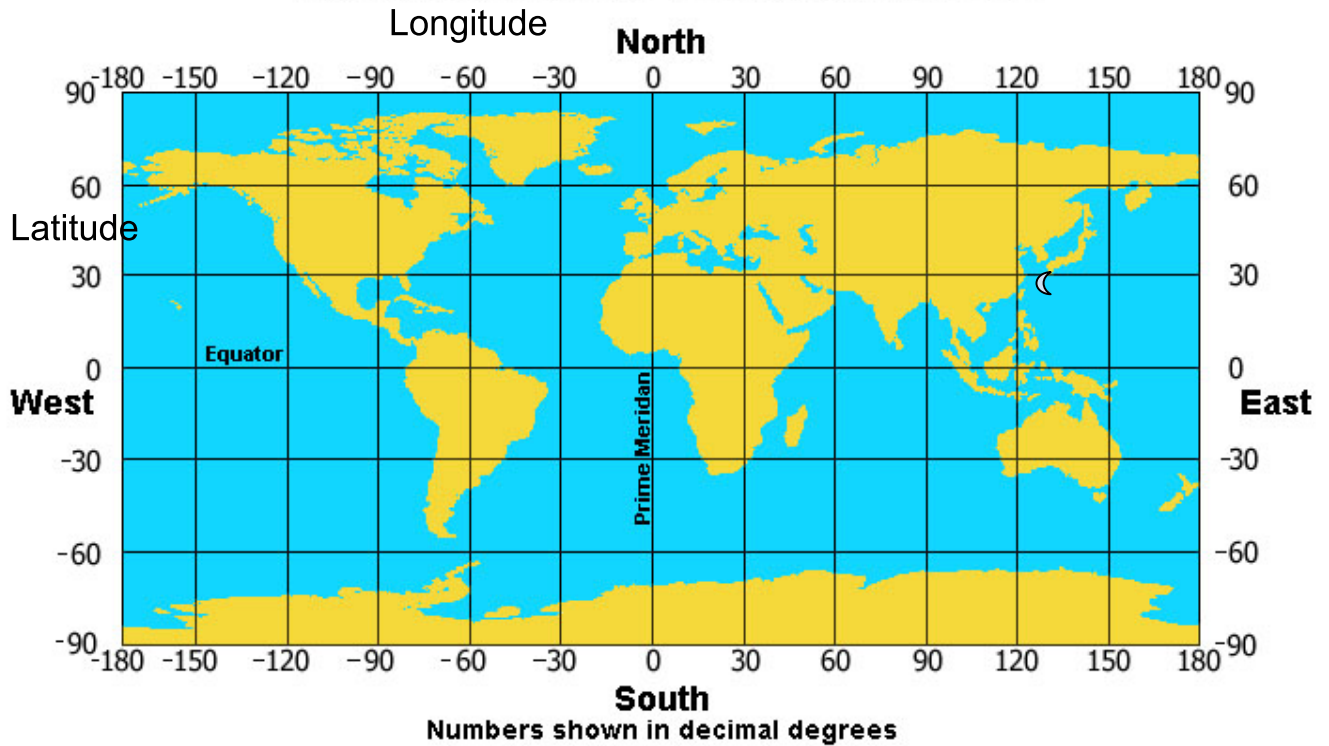
Collecting And Analyzing Data About Volcanic Eruptions

Scientists collect and analyze data to identify patterns and better understand how things work. For this lab you will need to collect data about volcanic eruptions and plot your data on the map that is provided on the next page.

There are many excellent websites that track volcanic eruptions. Use a search engine to find a reliable website that keeps track of volcanic eruptions around the world.

Plot the 30 most recent eruptions on the map

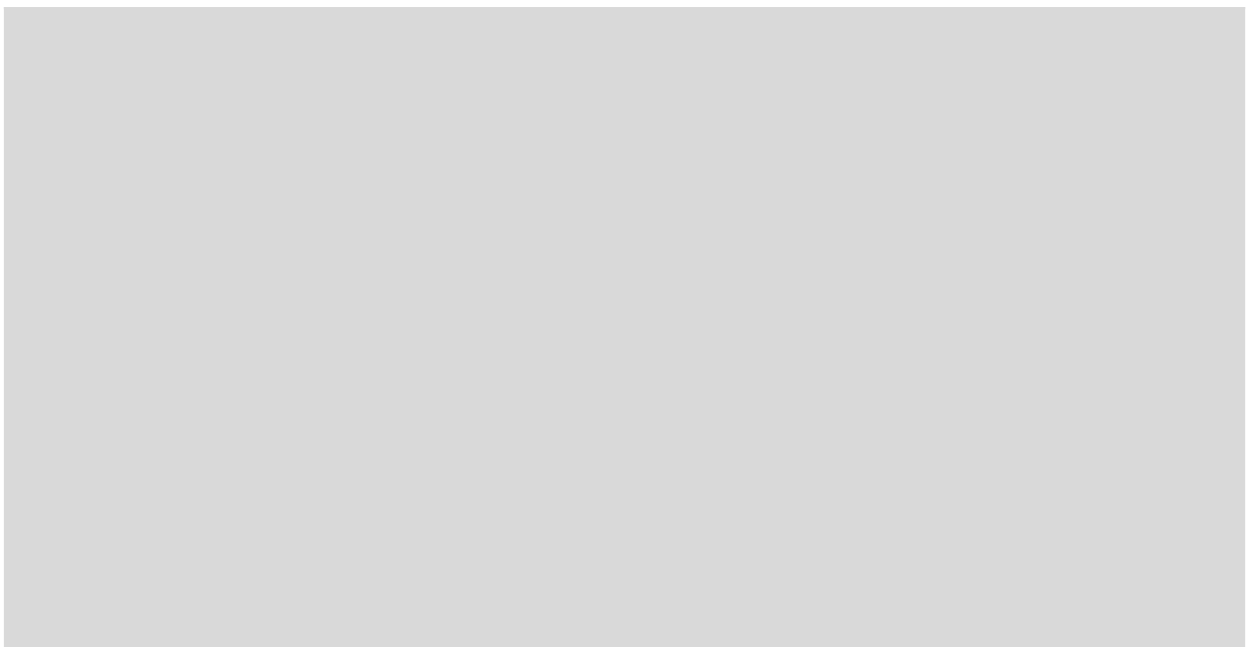
Latitude and Longitude Coordinates of the Globe in standard flat-map (*Mercator*) projection

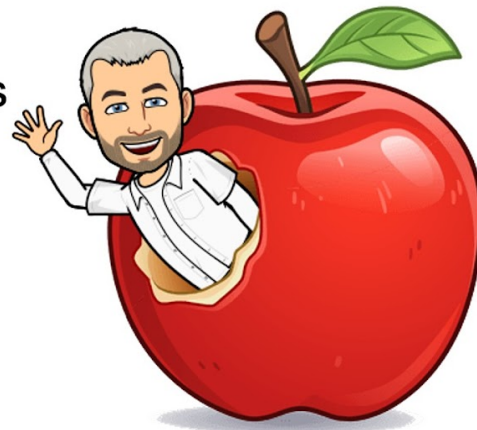


Analyze Your Data

Now that you have collected your data it is important to examine it, looking for any patterns that might be present. There are not wrong answers here. What matters is only that the answer you give is supported by the data you collected.

What patterns do you see in your data? In other words, what pattern is there on the map?





Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

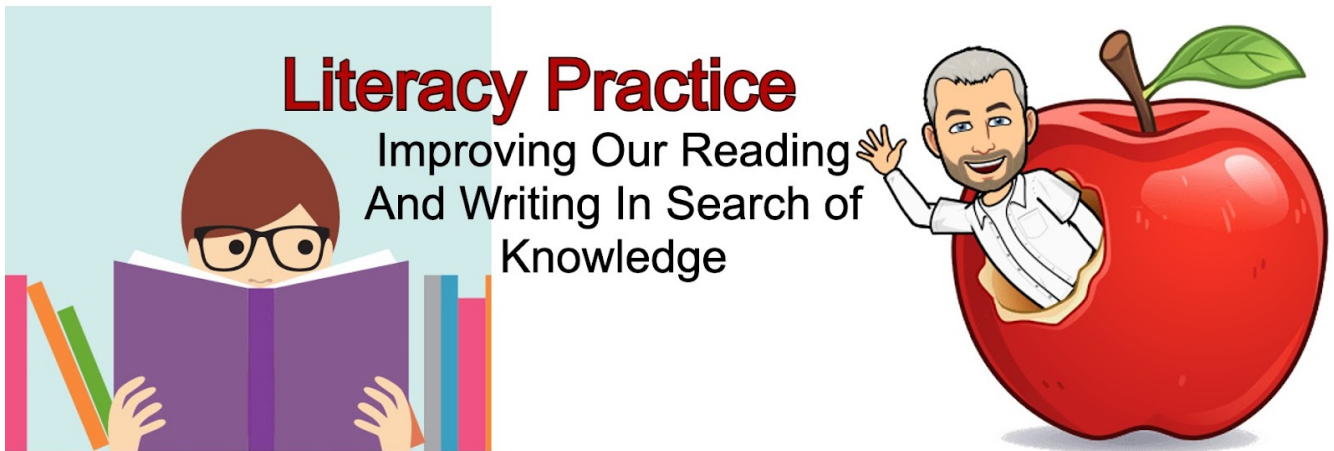
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
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- 8.
- 9.
- 10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Biomes

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/plate-tectonics/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

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I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

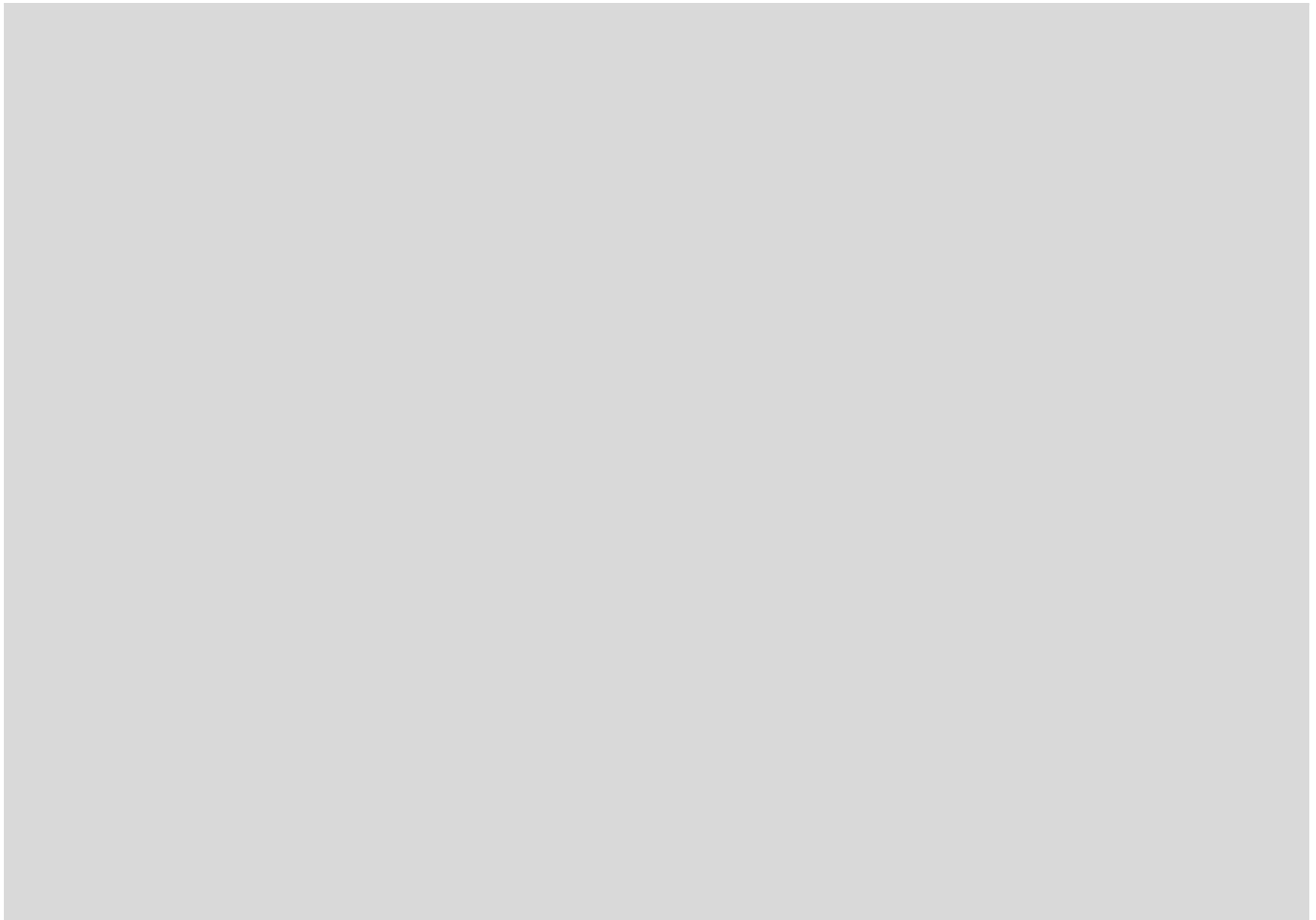
Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words describing how plates move, and each type of plate boundary.



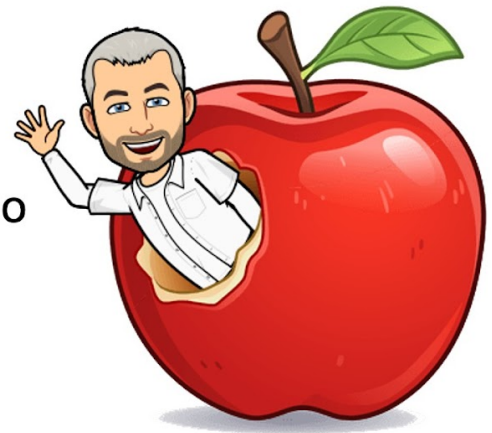
Name: _____

Date: _____



Applying Lab

Proving That We Can Do
It Ourselves



Activity: Applying Plate Tectonics

Directions: In this lab, you are going to recreate tectonic plates using graham crackers.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how plates move.

Take a single graham cracker. Place it on a table or desk. Keeping it flat on the table, try to pull it apart in opposite directions.

1. Explain what happened to your cracker when you pulled it apart.

2. Why do you think your cracker did this?

3. How does this relate to the crust of the Earth?

4. What kind of boundary is created when the crust pulls apart?

Take two graham crackers and lay them next to each other on a flat surface. Keeping them flat against the table or desk, push them toward each other.

5. Explain what happened to your crackers when you pushed them together.

6. Why do you think your crackers did this?

7. How does this relate to the crust of the Earth?

8. What kind of boundary is created when two tectonic plates collide?

Final Questions:

Answer each question using complete sentences.

1. **Where are rifts (also called ridges) located?**

2. **Explain in detail how rifts (ridges) form. Explain what rifts do to the crust.**

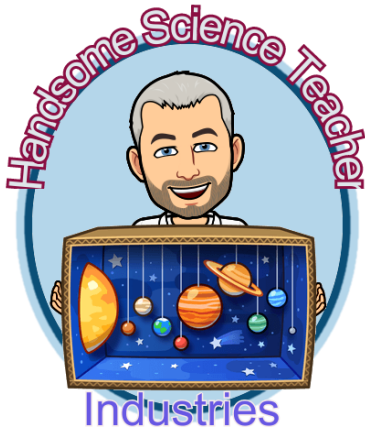
3. **Where are trenches located?**

4. **Explain in detail how trenches form. Explain what trenches do to the crust.**

5. **Which type of crust is denser? Which type is less dense?**

6. **Which type of crust is older? Which type is younger?**

7. **What is a tectonic plate? Are they under the crust or part of the crust?**



Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.

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Formation of Mountains

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about the different ways that mountains form. This includes when tectonic plates come together when they stretch out, and through volcanic activity.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is a mountain?
- How do mountains form?
- Plates push together.
- Plates Stretch Out
- Volcanic Mountains

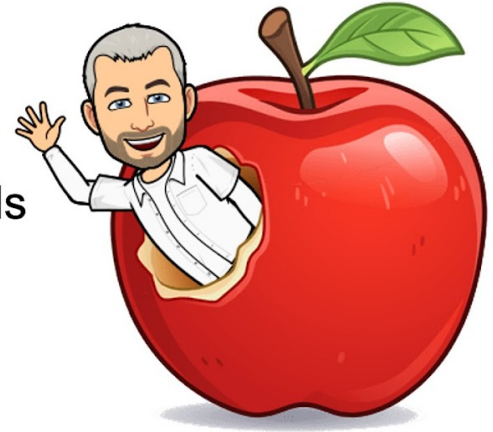
Name: _____

Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering Mountains

Directions: Follow the steps below to discover how mountains are formed.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how mountains form.

Part 1: Plates Push Together

For this experiment, you will need two pieces of cardboard, and sand or dirt. You can use poster board, or cut cardboard from a box, such as a cereal box. For the sand or dirt, you will need to get some from outside. Be careful not to make a mess!

Instructions:

Pile about an inch of sand or dirt evenly across both pieces of cardboard, creating two tectonic plates. Once you have your two plates created, slowly push them into each other.

1. Describe what happened when you pushed your two plates into each other.

2. Why do you think this happened?

3. How does this relate to mountain formation on the Earth?

Part 2: Plates Stretch

For this experiment, you will need a piece of rubber or other stretchy material, such as a balloon. Anything flat and stretchy will work. You will also need dirt.

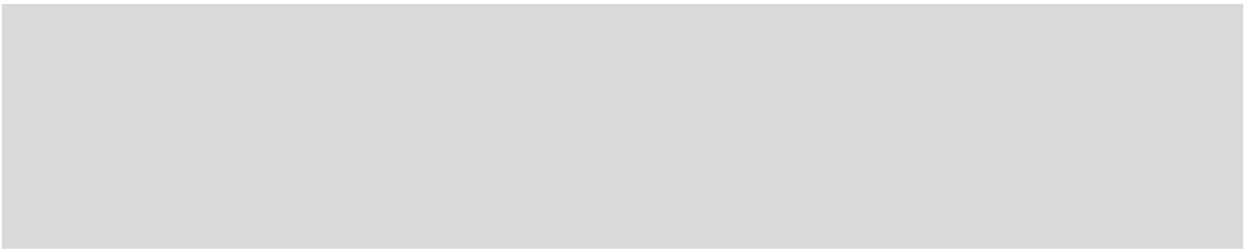
Instructions

Lay an inch of dirt across your stretchy material. Then slowly pull the material apart, and observe what happens to the dirt.

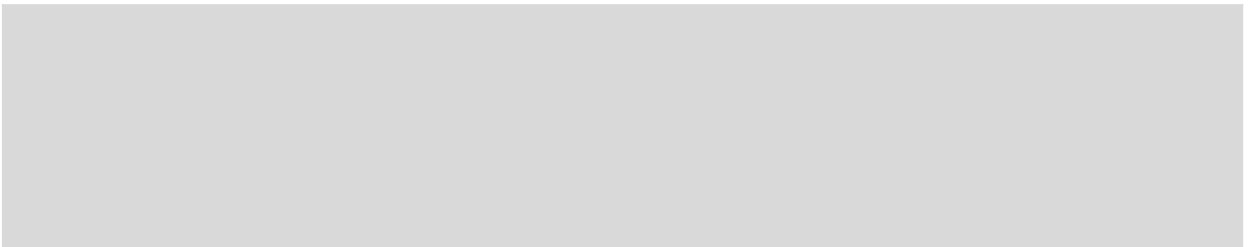
1. Describe what happened when you stretched the tectonic plate apart.



2. Why do you think this happened?



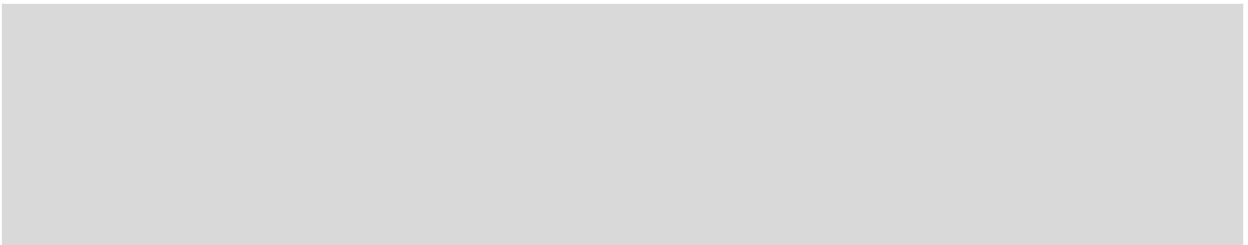
3. After being stretched apart, you should see clumps of dirt. How does this relate to mountain formation on the Earth?

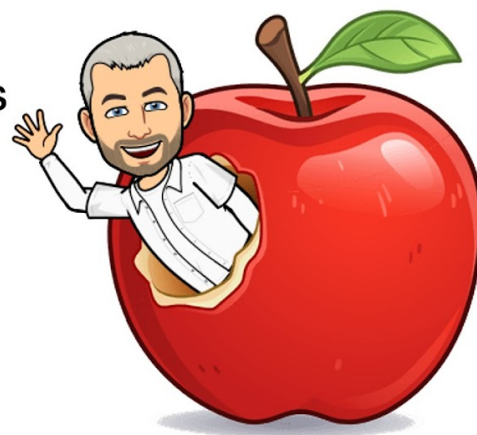


Part 3: Volcanic Activity

In the next mastery badge, we will be talking specifically about volcanoes. For now, I just want you to be aware that this is one way that mountains form.

1. Explain how you think volcanoes might form mountains.





Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

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Recording Your Learning

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Ten Things I Learned From This Video

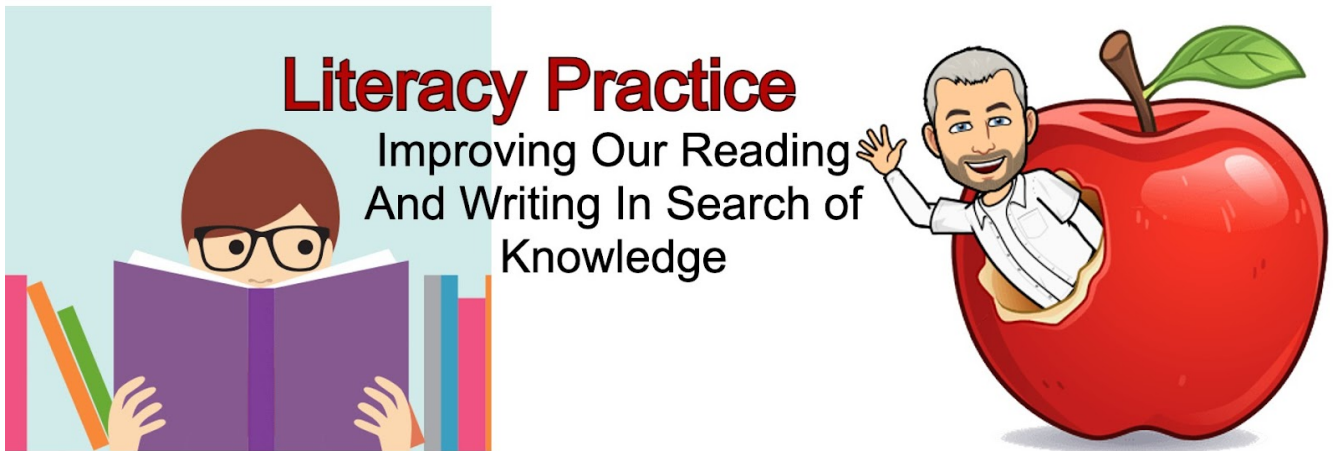
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- 1.
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Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Biomes

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

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1. Practice Reading For Understanding

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2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/mountains/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words describing different types of mountains and how they form.

A large, empty gray rectangular box intended for the student to write their response to the writing prompt.

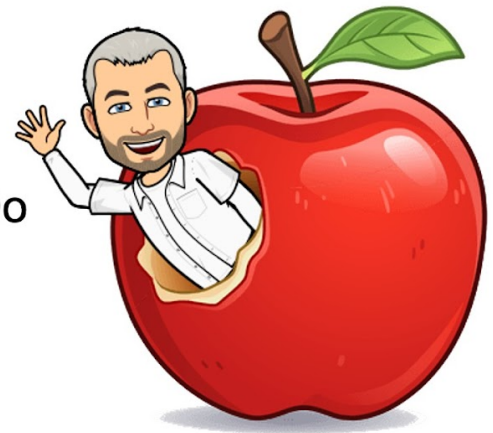
Name: _____

Date: _____



Applying Lab

Proving That We Can Do It Ourselves



Activity: Applying Mountain Formation

Directions: You Are Going To Write An Article About Mountain Formation



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how mountains form

Writing An Article:

Scientists write articles to inform the public about their discoveries. In your discovery lab you learned about three kinds of mountain formation, and you performed experiments recreating two of those. In this activity, you will be writing a detailed article explaining the difference between mountain formation caused by two plates crashing into each other, vs mountain formation caused by a single plate stretching out.

Your article should be detailed, and at least one page in length. Pretend that you are writing the article for someone who is younger than you. Make sure you write clearly so that they will understand.

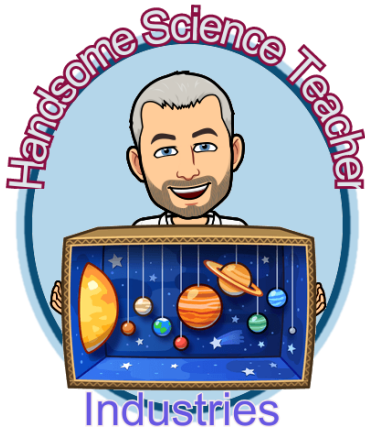
Final Questions:

Answer each question using complete sentences.

1. **How do mountains form from plates crashing into each other?**

2. **How do mountains form from a single plate stretching apart?**

3. **How do mountains form from volcanic activity?**



Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

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Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

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Keep this on file as evidence of your successful completion of this topic.

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Volcanoes

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about volcanoes, including how they form, their structures, and the various types of volcanoes.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is a volcano?
- Types of volcanoes
- Types of lava flows
- Structures of volcanoes
- Shield volcanoes vs composite volcanoes
- Cinder Cones
- Locations of volcanic activity on Earth.

Name: _____

Date: _____



Discovering Lab

Learning Through Hands On Activities



Activity: Discovering How Volcanoes Form

Directions: Follow the steps below to discover how volcanoes form.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how volcanoes form.

Part 1: Building A Volcano

For this experiment, you will need Playdough or clay in various colors, a very small cup such as an old pill bottle, baking soda, and vinegar. You will also need a clear straw to take a core sample with.

Instructions:

- Step 1. Using playdough or clay, build a very small mound around your tiny cup.
- Step 2. Put a half teaspoon of baking soda into the cup.
- Step 3. Pour a small amount of vinegar into the cup.
- Step 4. Watch the volcano erupt. Wherever the 'lava' flowed, you need to add more playdough.
Use a different color so you can see how each lava flow changes the shape of the mountain.
- Step 5. Repeat several eruptions. Each time adding more clay to wherever the lava went.

1. Describe how the volcanic mountain changed after each eruption.

2. What most surprised you, or was most interesting about this experiment?

3. How does this relate to the formation of volcanoes on the Earth?

Part 2: Taking A Core Sample

Step 1. Insert a clear straw into the side of your volcano (straight down) and take a core sample. A core sample shows scientists the history of a volcano. Each layer represents a different eruption event.

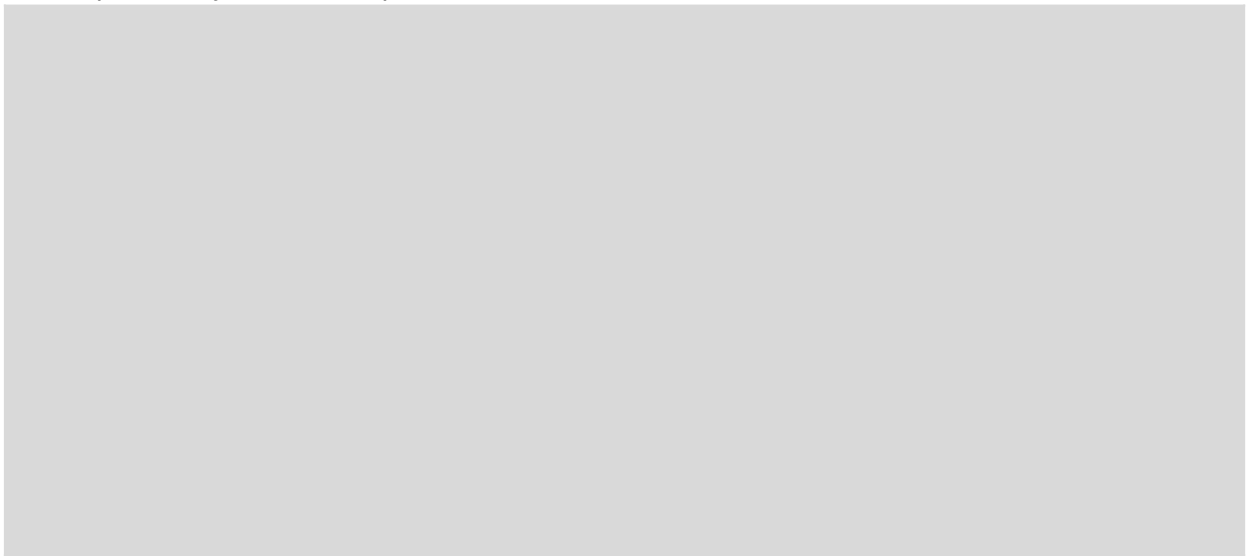
1. Describe how your core sample looks.



2. What do you think scientists might learn about volcanoes by taking core samples?



3. Draw a picture of your core sample



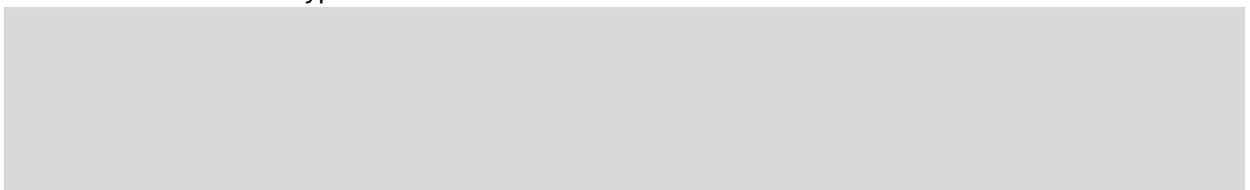
Final Questions:

Answer each of the following questions using complete sentences.

1. In your own words, explain how volcanoes form.

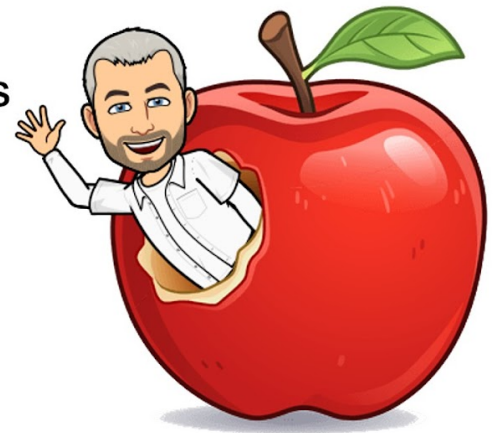


2. What are the three main types of volcanoes?



3. How are shield volcanoes and composite volcanoes different?





Handsome Science Teacher One Take Videos

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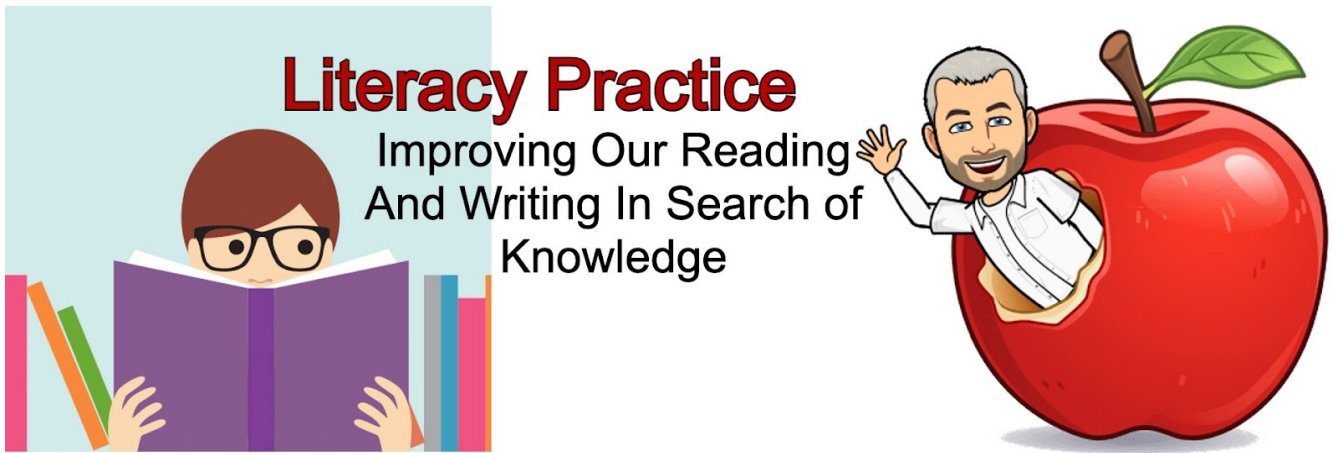
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Activity: Reading And Writing About Biomes

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2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/types-of-volcanoes/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words describing what volcanoes are, and how they form.

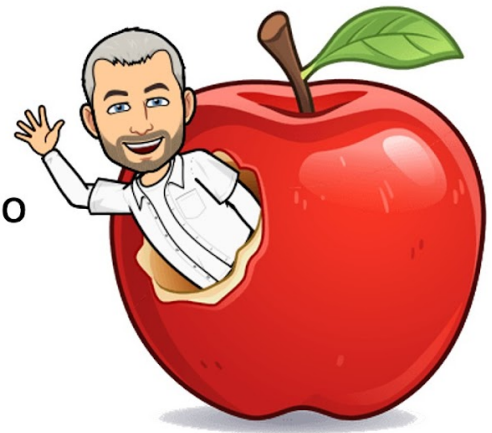
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Date: _____



Applying Lab

Proving That We Can Do
It Ourselves



Activity: Applying Volcanoes

Directions: You Are Going To Create A Diagram of A Volcano.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about the structure of volcanoes.

Diagram of A Volcano:

For this assignment, you are going to create a detailed drawing of a volcano, including each of the following:

- Cone
- Crater
- Main Vent
- Secondary Vent
- Layers From Past Eruptions
- Magma (underground)
- Lava (above ground)
- Ash Cloud

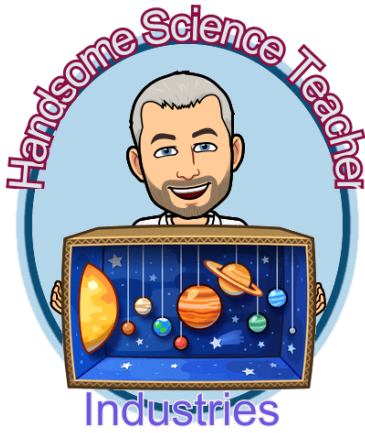
Your drawing should be done in color and should be labeled.

Final Questions:

Answer each question using complete sentences.

1. Where do composite volcanoes usually form?

2. Where do shield volcanoes usually form?



Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





Earthquakes - A STEM lab

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about earthquakes, how they occur, the various types of faults found in the Earth's crust, and earthquake waves.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is an earthquake?
- What causes earthquakes?
- Types of faults
- Types of earthquake waves
- Building structures to withstand earthquakes.

Name: _____

Date: _____



Discovering Lab

Learning Through Hands
On Activities



Activity: Discovering Vibrations Through Solids

Directions: Follow the steps below to discover how waves vibrate solid objects.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how earthquakes work

Vibrations create waves that travel through solid objects. You have probably experienced this, such as when a large truck drives by your house, or an adult walks down the stairs in your home. In this lab we will be experimenting with how waves move through solid objects.

Experiment 1: Waves Through Metal

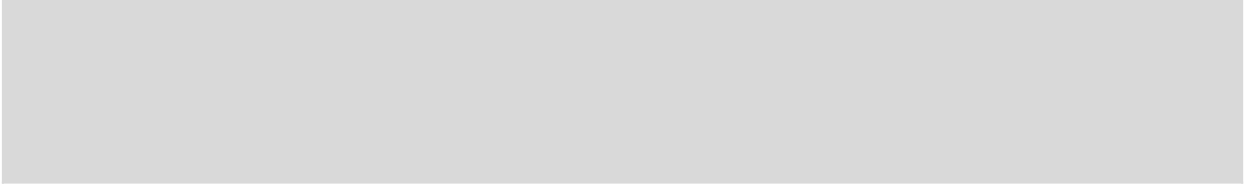
1. Place a metal pot upside down on a table.
2. Place your hands on the sides of the pot.
3. Have someone else tap the top of the pot with a spoon.

Describe what you felt in your hands as the other person tapped the top of the pot.

Experiment 2: Dominoes

1. Using the same pot stack dominoes or similar-sized objects onto the pot.
2. Using a spoon, clank the side of the pot.

Describe what you observed when you tapped the top of the pot. What did your dominoes do?



Explain why you think this occurred.

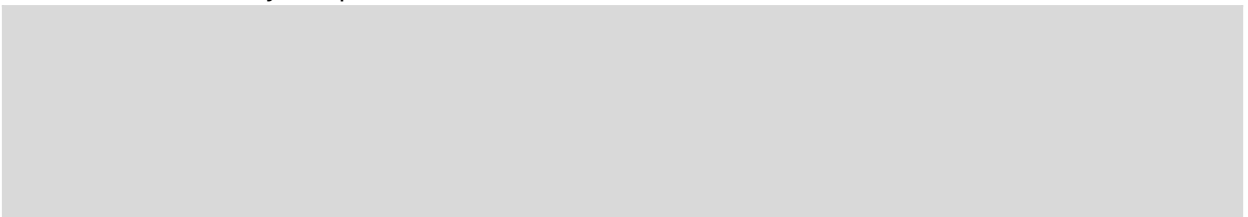


Experiment 3: Detecting Waves

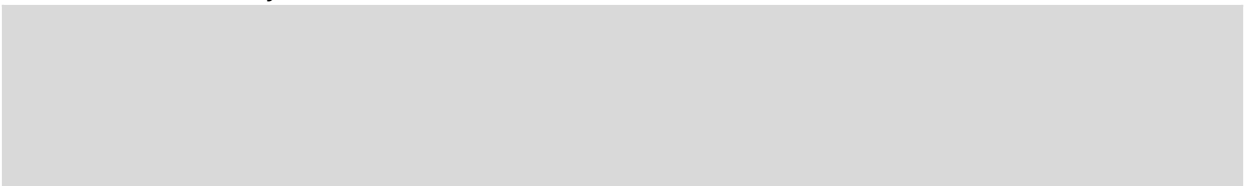
Scientists use sensitive machines called seismographs to detect earthquake waves as they travel through the Earth's crust. These waves can be very difficult to feel with your hands, but seismographs are designed to be able to sense them. We can create our own very rudimentary seismograph using a cup of water.

1. Fill a glass with water, and place it on a table in the middle of the room.
2. Observe the water in the glass.
3. Tap the table and observe what happens to the water.
4. Walk around the room and observe what happens to the water.

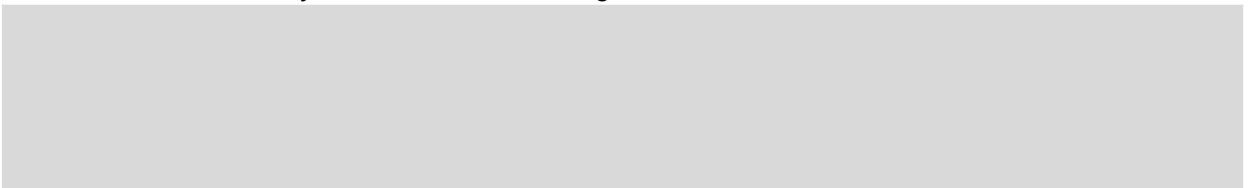
What does the water do when you tap on the table?



What does the water do when you walk around the room?




Why does the water move the way it does? What is causing the water to move?



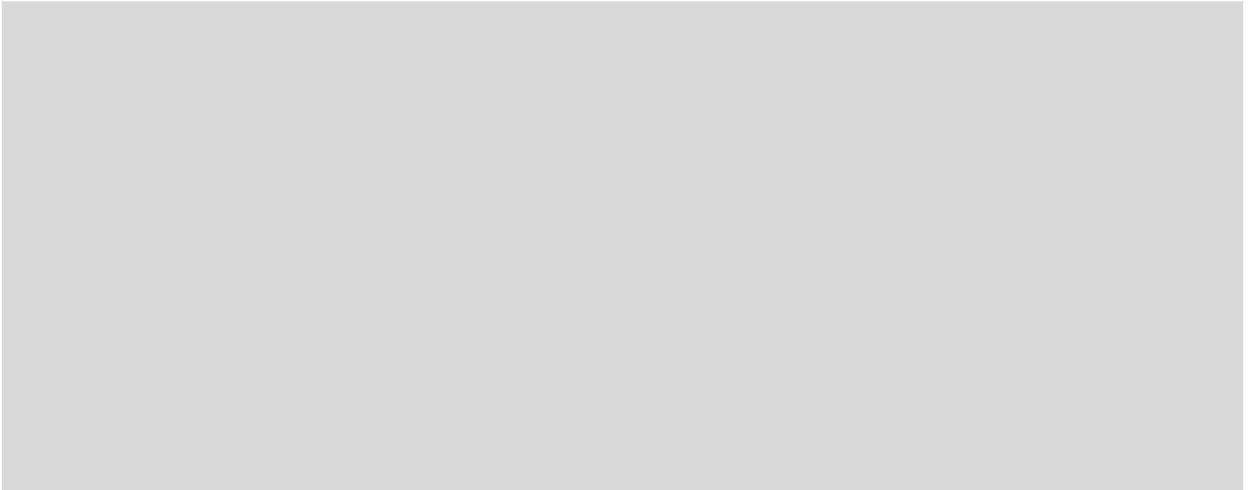
Final Questions:

Answer each of the following questions using complete sentences.

1. In your own words, explain what an earthquake is.

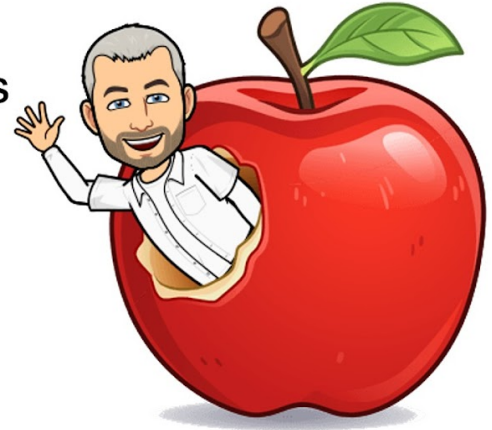


2. Explain what happens when waves move through solid objects.



3. What do you think might cause or create waves in the Earth's crust?





Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

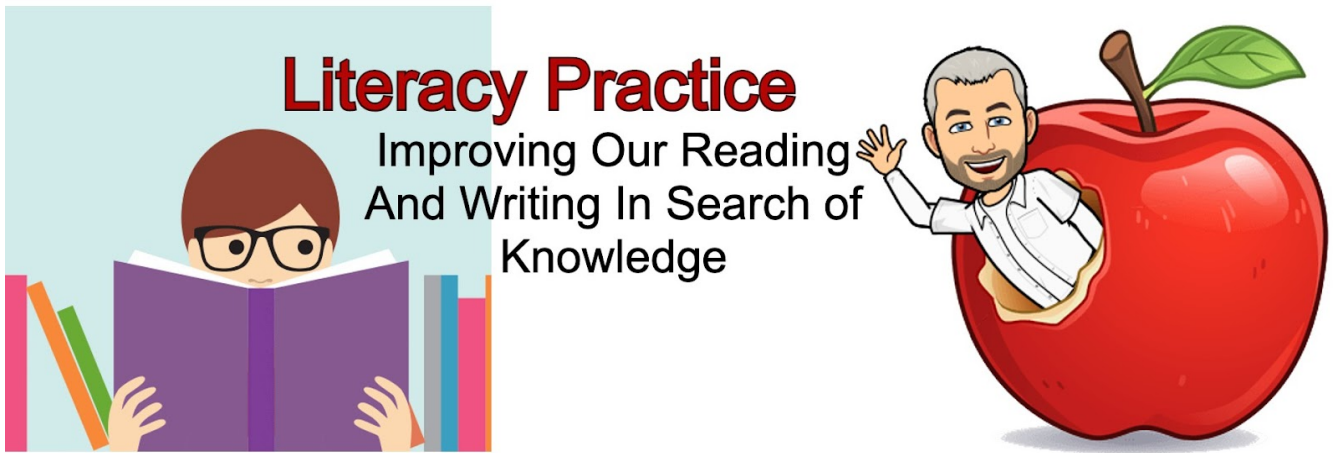
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

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1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/earthquakes/>

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I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write three paragraphs in your own words describing what earthquakes are, and how they occur. Discuss some of the types of waves that are created during an earthquake.

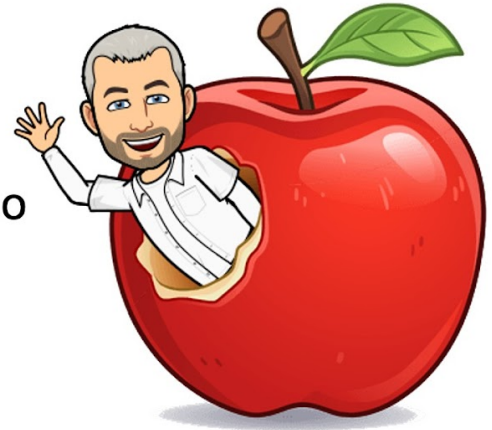
Name: _____

Date: _____



Applying Lab

Proving That We Can Do
It Ourselves



Activity: Building An Earthquake Compliant Structure

Directions: Create an earthquake proof structure following the directions below.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To demonstrate your understanding of how earthquakes affect structures.

Build an earthquake-proof structure:

For this lab, you will need some basic building supplies. You could use things like toothpicks and marshmallows, popsicle sticks and rubber bands, etc. You are not allowed to use glue, or other more permanent solutions.

Goal: Build a tower as tall as you possibly can that can withstand an earthquake.

Using your supplies construct a tower that you think will withstand an earthquake. You want your tower as tall as possible, but that will not fall over during an earthquake.

Test Your Design

After your tower is completed, test it by placing it in the middle of a table, and having someone else shake the table back and forth for 30 seconds.

Improve Your Design

If it fell over or broke, how can you improve your design?

If it did not fall over, can you make it taller?

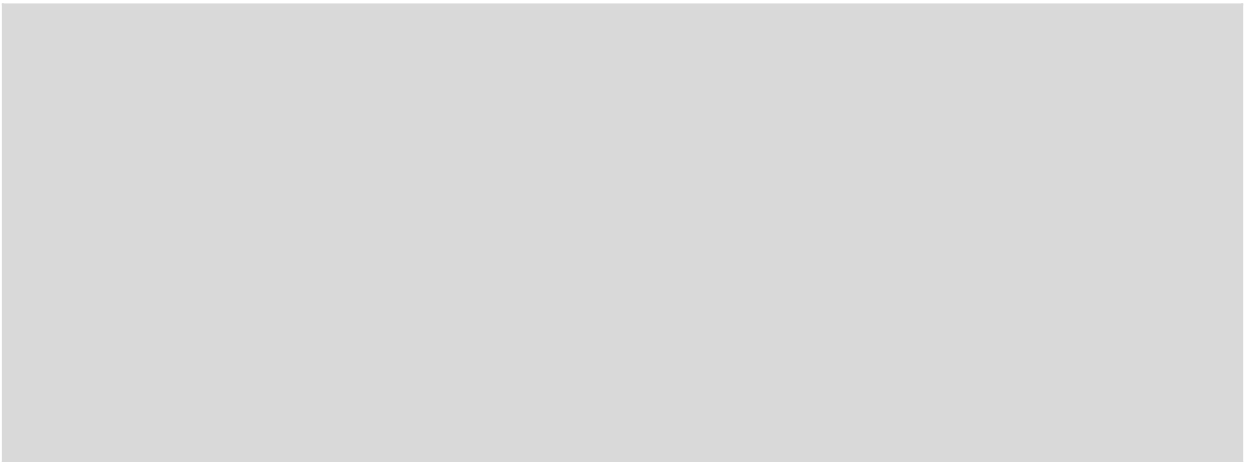
Test/Redesign

Continue testing and redesigning your structure until you are confident that it is as good as you can possibly make it.

Draw a picture of your original tower design.



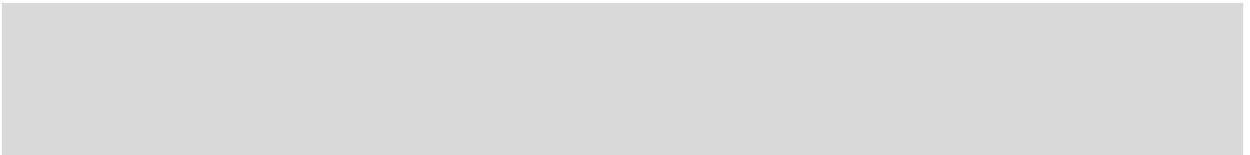
Draw a picture of your final tower design, after going through the engineering process and improving it.



Final Questions:

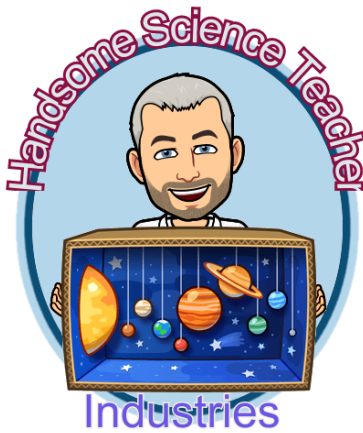
Answer each question using complete sentences.

1. **What are the main types of waves that travel through the Earth during an earthquake?**



2. **What are the main types of earthquake faults?**





Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

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Eighth Grade Is Up Next



Congratulations On Finishing Seventh Grade!

Next Stop! Eighth Grade!! In eighth grade we will study biology.

Visit HandsomeScienceTeacher.com to download a digital copy of the eighth grade textbook for free. If you would like a physical copy, they can also be purchased on HandsomeScienceTeacher.com.

HOMESCHOOLING